

1 THE INTERIOR OF ST. PAUL'S CATHEDRAL.

PICTORIAL
CABINET OF MARVELS
ADVENTURES



See page 342.

JAMES SANGSTER AND CO.,
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THE PICTORIAL Cabinet of Marvels.

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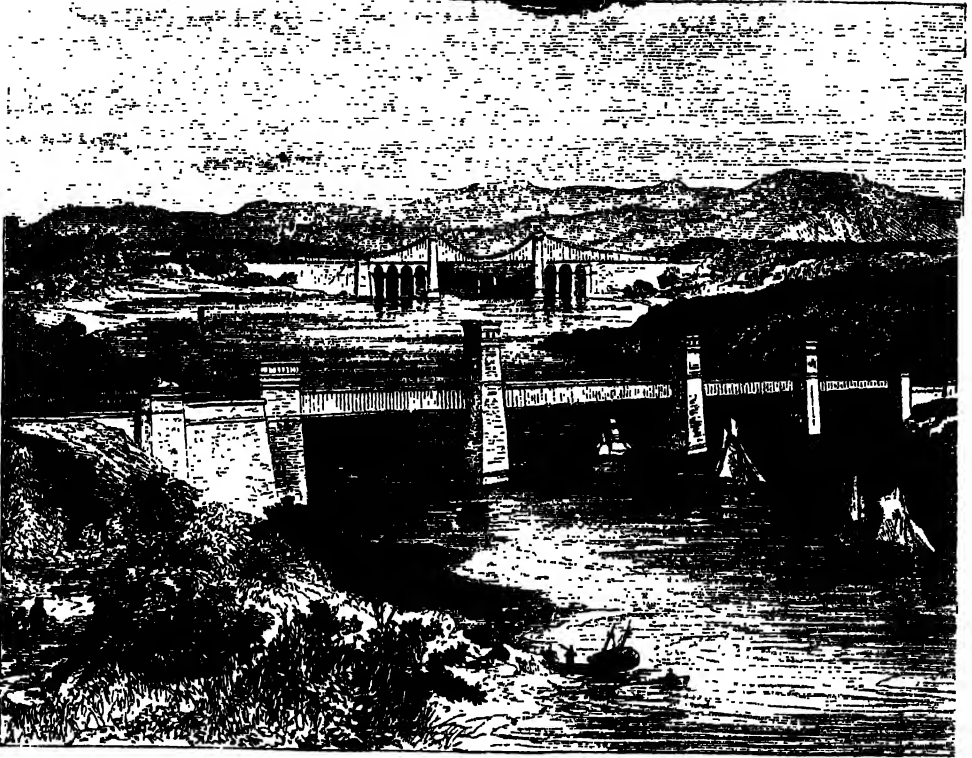
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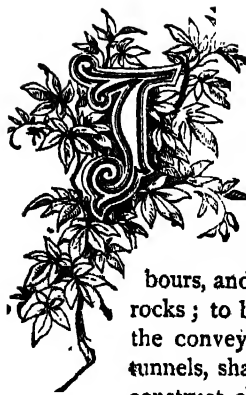
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RAILWAY BRIDGE AND SUSPENSION BRIDGE, MENAI STRAITS.

WONDERFUL BRIDGES.



It has been well said that "to the civil engineer the word *impossible* is scarcely permitted. His professional duties call upon him to devise the means for surmounting obstacles of the most formidable kind. He has to work in the water, over the water, under the water; to cause streams to flow; to check them from overflowing; to raise water to a great height; to build docks and walls that will bear the dashing of the waves; to convert the dry land into harbours, and low-water shores into dry land; to construct lighthouses on lonely rocks; to build lofty aqueducts for the conveyance of water, and viaducts for the conveyance of railway-trains; to burrow into the bowels of the earth with tunnels, shafts, pits and mines; to span torrents and ravines with bridges; to construct chimneys that rival the loftiest spires and pyramids in height; to climb mountains with roads and railways; to sink wells to vast depths in search of water. By untiring patience, skill, energy, and invention, he produces in these several ways works which certainly rank among the marvels of human power."

During the present century iron has been commonly substituted for stone in the construction of large arches. By its use bridges and viaducts have been thrown across

ivers and valleys previously considered impracticable. A rude kind of suspension bridge has been in use for ages in China, Peru, and other remote countries; but their use on a large scale is of quite recent date.

Although excelled by others since, the finest suspension-bridge up to that time was the one constructed in 1826 by Mr. Telford across the Menai Straits, to connect the island of Anglesea with the mainland of Wales. The span of the suspended or central arch, between the highest points of the chains on the top of the piers, and 153 feet above high-water, is 560 feet. Seven stone arches, of $52\frac{1}{2}$ feet span, make up the rest of the bridge; four of those being next the island, and three on the Welsh coast. The chains, of which there are sixteen, reach over the whole structure, and, besides, descend 60 feet into sloping pits or shafts, to where they are secured by means of cast-iron frames ingrafted in the rocks; the entire length of each chain being 1714 feet, or almost a third of a mile. The two suspension piers of the great arch rise 52 feet above the roadway, and are surmounted by cast-iron blocks and saddles, moveable upon friction rollers, for the purpose of allowing the chains which pass over them to move freely when expanding or contracting under change of temperature. The suspension platform, elevated 100 feet above high-water, is occupied by two carriage-roads, each 12 feet wide, with a footpath of 4 feet between them. These pass through arches in the suspension piers; and each is separated, and strongly railed in, by lattice iron work, both for protection and for stiffening the roadway, to prevent vibration. Each of the chains is fivefold, and of such complexity in design, that any part of the chain may with safety be removed at any time for repair, or be replaced by a new one.

The Menai Bridge, however, has been greatly surpassed, both in length and in height, by a far lighter and much less expensive one, though of great strength, which has since been constructed with a span of 870 feet, over the Sarine at Friburg,

in Switzerland. This was completed in the year 1834.

Of iron railway-bridges the Menai tubular bridge is the largest structure of the kind in Great Britain, though certainly not the most beautiful. It crosses the Menai Strait at a point about a mile from Telford's suspension bridge. On a rock in the centre of the Strait a stone tower is built to a height of 192 feet above water-level; two other towers are built to a similar height; and these three towers, with the shore abutments, divide the whole width of the Strait into four spans—two of 460 feet, and two of 230 feet. The grandest *lift* ever effected in engineering was to raise each quadrangular iron tube complete to its own portion of span—the weight being 1800 tons raised 192 feet. There being double tubes, each for one line of rails, there were four portions of 460 feet and four of 230. There were 126 *miles* of rivets, to fasten the plates of which the tubes were made; and there were 2,000,000 rivets in all! There are 12,000 tons of iron, and 105,000 tons of stone and brick, and 580,000 cubic feet of timber used in scaffoldings and platforms for buildings.

The Niagara suspension bridge is, from the natural obstacles of the situation, one of the most daring undertakings of modern engineering. The roaring rapids are immediately beneath, 250 feet below the level of the rails. The bridge, 800 feet long, is much shorter than many railway bridges; but it was difficult to build in such a situation. It is not supported by chains of plate-links like most suspension bridges, but by four enormous cables of wire, stretching from the Canadian cliff to the United States cliff of the river. Each cable consists of no less than 4000 distinct wires; the four cables pass over the tops of lofty stone towers; and the roadway hangs from them by 624 suspending rods. A locomotive first crossed the Niagara in 1855, forming the first railway link between the British and United States empires. This, like a beautiful bridge over the Jumna, near Delhi, has a railway over a road and foot way.

The Victoria railway bridge in Canada is, however, the largest and grandest in the world. It consists of 24 piers, rising 60 feet above the water, with intervals of 242 feet apart, except one of 330 feet in the centre.

These massive piers support a quadrangular iron tube, more than 6000 feet long, 19 to 22 feet high, and 16 feet wide; and through this tube the trains run. Owing to the depth of the St. Lawrence at the spot

where the bridge crosses at Montreal, the swiftness of the current, and the enormous masses of ice accumulated there every winter, the work of constructing the bridge was one of trying difficulty, and lasted from 1854 to 1860. Every spring, when the ice of the St. Lawrence breaks up, the crushing, crashing, and pressure against the piers of the bridge are almost inconceivable, subjecting the work of the engineers to a very prolonged and severe test.



A WONDERFUL COAL MINE.

HE recently settled Territory of Colorado, in the United States, has some wonderful natural curiosities.

Amongst them is a vein of coal about five miles long. A recent traveller thus describes a visit to it:

"We are bowling along in a coal truck attached to a blind mule, through a vein of solid coal something over five feet in diameter. It is a weird ride, this mile or more into the inky bowels of the earth, the faint shadows from our diminutive lamps causing a ghastly effect not at all lessened by the blackness of the coal on either side and overhead. Every few feet we peer into the dusky depths of the apparently unending series of side chambers, catching quick glimpse of the little fire-flies, as the miners look to be, as we pass so swiftly on. We see not the forms of the men, their faces, nor their hands, only the lamp-wicks' sickly flaring from the unseen hats. Every now and then piles of powder in canisters almost block up the entrance to the chambers, and

at one point we are shown the very fuse that sent a poor miner to his death but a day or two before. But still the old blind mule trots on, and the passing through and rapid closing behind us of the heavy oaken door that preserves the little of wholesome air left in the drift, is as if it barred us for evermore from the world behind. The ride in appears an age; the ride out, but of a moment's time in comparison. There are eighty-six side chambers, or rooms as the miners know them, in the main entry, fifty-seven in another entry, and in all four miles of track upon which the coal is carried to the outer world. The veins average five feet two inches, and run three and one-half miles east and west, and ten miles north and south. A hundred miners are at work, and the yield averages four hundred tons per day.

The gigantic solid lump of shining coal eight feet nine inches long, six feet across, and four feet four inches high, that attracted such great attention at the Centennial Exhibition in 1877, being beyond all comparison the greatest single piece of coal on exhibition, was taken from this mine. It weighed seven tons, and was cut and brought out of the mine in three days."

ADVENTURES WITH BEARS.



I was cruising about the Bay of San Francisco, in a ship's long-boat, with three or four sailors, in search of any "wreck" (or "flotsam," as our old statutes would call it), such as building-piles or spars of vessels, that we might chance to come across. Sometimes these expeditions were successful, at other times a failure. I remember once, after a severe easterly gale, we picked up a number of valuable articles, evidently from the wreck of some unfortunate vessel. Amongst the spoil was a cask of lime juice, and another cask of preserved eggs, for which we obtained the several prices of fifty and one hundred and thirty dollars—sums which, in English money, are together equivalent to about £38. The latter may seem a large price; but it is necessary to remember that at that time—namely, in 1849—provisions of all kinds were fearfully expensive, especially eggs, which were very scarce.

But to continue my narrative. I have said that we were sailing about the harbour in search of wreck, and, as often happened, night closed upon us when we were a long way from home. I believe the Bay of San Francisco is some thirty miles in length; so, according to our custom, we made for the nearest land, anchored our boat, and went ashore. In what particular portion of the bay we were situated none of us knew or cared. It seemed a somewhat desolate spot, as far as we could discern through the dark and drear autumn night. However, our requisites for camping—namely, wood and water—were easily procured, and in a few minutes a capital fire sent forth its cheerful blaze and genial heat. Then our blankets, frying-pan, kettle, etc., were

brought ashore, and in a short time our preparations for supper were complete. The kettle was singing on the embers, the frying-pan was spluttering away with the rashers, and the wave-worn wreckers were seated in a row, gazing with hungry and anxious faces on the approaching "feed;" when, suddenly, a dark and formidable-looking object emerged from the gloom of night in the landward direction and advanced slowly towards our fire.

"A bear, and a grizzly one," shouted the American we had with us, as we all started to our feet. That was enough. *Sauve qui peut* was the order of the day. Resistance was not for a moment thought of. Supper and our traps were in an instant abandoned, and pell-mell we rushed down to the beach, and never looked behind till we were fairly in the boat and getting the anchor up. Then, what a sight greeted us! There sat our grizzly enemy on his haunches, gazing with the greatest nonchalance into the glowing embers of the fire—our fire, and evidently enjoying the pleasant warmth, while we were shivering in the cold. Slowly and sadly we got up our anchor; more slowly and more sadly still, we placed our oars in the rowlocks and "gave way" in a very melancholy mood; but as our boat struck out on her course, our eyes were still fixed on the receding shore, where the fire still blazed brightly, where the bear still sat on his haunches gazing into 'the blaze, and where our supper was by this time nearly ready for his hungry maw, by us uneaten.

Now, perhaps, some gallant volunteer reading this would consider that in this affair, the white feather was shown by the writer and his companions; but our volunteer would be mistaken. To cope with a grizzly bear, a good rifle and a good rifleman are absolutely essential. The rifleman must also be a first-rate

hunter, accustomed to kill large game; for the sport is intensely dangerous, as it is only in one or two places that a wound can be inflicted which would prove instantaneously mortal on this toughest of monsters; and, should the shot fail, the hunter would have no time to load again ere the beast would be upon him. Hardy trappers and hunters in the prairie shrink from a conflict alone with the grisly bear; and the Indian brave who prevails over him advances a greater step in the estimation of Indian chivalry, than if he had taken three scalps from human foes in a fair stand-up fight.

After I had been a denizen of California for some two years, business compelled me to take my departure for the neighbouring State of Oregon. When my affairs in that state were arranged, I determined to travel back overland to San Francisco, in company with a mule train proceeding there—no slight journey, as it embraced a distance of some thousand miles, not exactly over a macadamized road. On the contrary, mounted on good horses, we followed a slight Indian trail, scarcely ever of more importance than a sheep track, and oftentimes quite obliterated. I shall, however, avoid a long digression of describing how we climbed mountains, forded rivers, and skirted precipices, and how we more than once had perilous skirmishes with Indians. The grizzly bear is my theme, and it devolves upon me now simply to relate how again I came into juxtaposition with this formidable foe.

After travelling very hard for a week or so, we found ourselves one night camped on the banks of the Roque river, one of the rivers of Oregon, where gold has since been discovered; and, as our cattle were rather in a poor condition, we resolved to give them a rest by camping all the next day. Feeling myself in the course of that day inclined for a gentle ride, towards the afternoon I saddled my horse, a good specimen of Indian breed, which I had bought from a Pawnee chief. Taking my rifle across my saddle-bags, I set off to see whether I could

get a shot at an elk—a species of deer commonly called wapiti, which abound in that region. I rode out from camp, and after cantering some four or five miles, came to the end of the little prairie on which we were camped, and got into broken ground, well wooded, and with a thick growth of “chapparal,” that is, “underwood.”

Moving along at a slow amble, and keeping a good look-out for game, and also for any lurking Indian,—for we were now on hostile ground,—I suddenly felt my horse tremble under me, and rapidly quicken his pace to a slashing gallop. Looking to my right hand, to my intense astonishment, and I may say fear, I beheld a monstrous bear, evidently an old grizzly, rising from his lair beneath a tree.

In a moment I knew he would pursue me, for I had “crossed his wind.” This requires explanation; but I had often been told by hunters of experience that this species of bear does not attack men if they pass sideways or in his rear, but should they on the other hand, pass to windward, he is instantly exasperated and gives chase. Whether this statement is fanciful or not, I am sorry to say that in my case it proved too true; for in another instant the grizzly seemed to have made up his mind, and was advancing towards us in full pursuit.

Now, had I been upon the prairie, I should have cared little for my foe. I knew my horse, and though he was of Indian breed, as I have said before, he was remarkably fleet in his gallop; and the grizzly bear, though his speed, especially for a short time, is not to be despised, is certainly no match for a fleet horse on a level; but then, in this case the brushwood was very heavy, and only to be passed by a succession of small leaps, fearfully delaying at a time like this, while my pursuer's heavy body crushed indifferently through bush and brier. With the end of my lasso, my spur, and voice, I urged on my terrified horse. The rein with Indian horses is of little avail; they do not understand the bit, and in a case of emergency it is better not to make much use of it. My poor horse, however,

required neither of these inducements to do his best. His Indian instincts had told him that a dreaded foe was at hand, and nobly did he strain every nerve to save himself and his rider.

With one eye upon our course, I regarded at intervals our dreadful pursuer. Infinitely quicker than it takes to write it, I at once appreciated the desperate nature of the situation. In the first place, I saw that in our relative speed my horse was much inferior to our enemy, and that he was nearing us fast, owing, as I said before, to the broken ground. Unless, then, I could gain the edge of the prairie in a comparatively short period, a death struggle must inevitably ensue. But then I calculated, in the second place, that I must be at least a mile from the prairie, that wished-for refuge, and at less than half that distance I should be overtaken. True, I had my rifle in my hand, and my revolver in my belt, both loaded. I might fire at our foe. A moment's reflection convinced me that at present it would be a useless attempt. Even were I standing on firm footing, I might not succeed in sending a ball into any vulnerable part of the bear. But a flying shot from the saddle—it was simply absurd to attempt it. A thousand to one it would have proved a failure.

I determined, then, to reserve my fire till we should be at close quarters,—a contingency that, sad to say, appeared most unpleasantly imminent; for, in spite of all my horsemanship, and the gallant efforts of my Indian steed, a space of hardly twenty yards now intervened between pursuer and pursued. The moment, then, was approaching for action. Dropping my useless reins on my horse's neck, I examined carefully the cap of my rifle, opened the flap of the case of my revolver, and by a glance assured myself that my "Green River Knife" (the best make of bowie knives) was in its usual place—my boot. Then I carefully threw back the heavy folds of the Mexican poncho I wore, to leave my arms free to hold my rifle. As I did so, an idea struck me. In a moment I had slipped my

head out of the poncho, and had it in my hands, allowing it to flutter to the full extent of its folds. Then I released it from my grasp, and it fell, as I designed, between my horse and our enemy.

My stratagem was successful; in the midst of his wild career the bear suddenly pulled up at the sight of the fallen mantle, and stood over it examining it curiously. Well was it for me that in my younger days I had been a keen reader of travels and adventures, and by that means become possessor of the little stratagem that perhaps saved my life. I again seized my abandoned reins, and with voice and spur urged on my panting steed. It was well I did so. After a few seconds' delay, which however enabled me to put an interval of perhaps a hundred yards between us, my ruthless foe again resumed his pursuit. Again he had the advantage in speed. In vain was all my horsemanship; in vain did I sacrifice my Mexican sombrero, by throwing it to mother earth, devoutly hoping it would have the same effect as the poncho. It was useless. Bruin passed it with contempt; he was not to be "done" a second time.

On went the chase, and again did I have the mortification of seeing the space between us, gradually diminish, and my fate but a question of minutes. As this direful conviction forced itself with irresistible power on my mind, even at the very next moment a ray of hope burst upon me. I cast a despairing glance ahead, and to my intense relief saw the ground was getting clearer. I was close to the edge of the prairie. I shouted aloud in exultation; for, as the ground got more and more unencumbered, my horse drew gradually ahead. A few seconds sufficed to double the space that intervened between us and our foe. A few minutes, and we had gained a full hundred yards. Hurrah! A few hundred yards more, and we shall be safe,—safe on the prairie.

At this moment a stumble and a crash ensued. A thousand lights danced before my eyes. My sorely-pressed Indian steed



ATTACKED BY POLAR BEARS.

had lost his foothold on the polished surface of a prostrate barked pine-tree, and together we had come headlong to the ground. Half-stunned by the fall, nevertheless I scrambled to my feet in a second, and seized my rifle, which lay uninjured close at hand, and looked around. My poor horse still lay where he fell, snorting piteously with fear. Intuitively I felt there was not time to raise him and mount ere our enemy would be upon us. There was but one hope now remaining: it was to fight for it. Sternly and gloomily I mentally accepted the alternative, and with a throbbing heart but a steady eye and firm wrist, with my rifle at my shoulder, with my back against a tree, I waited for my foe. I had not to wait long. On he came; for a moment I thought he hesitated which to attack—my steed or myself. I confess, in that moment of peril I sincerely wished he would single out the former, who lay some ten yards distant from me; but it was not to be. Slightly diverging, the bear charged full upon me. I knew my life depended upon the accuracy of my first shot; if it failed, I should hardly have time to draw forth my revolver for another.

When but ten yards lay between us, and he was gathering himself up for a final spring, I took careful aim between the eyes, and fired. A crash, a hideous growl, a second of intense suspense, the smoke lifted, and I alone stood erect. The hideous, gigantic form of my adversary lay prostrate on the ground, a nervous twitching of the limbs alone betraying that life had not yet departed. With a cry of triumph I rushed upon him to administer the *coup de grace*. Madman that I was! in that moment of exultation I lost my presence of mind and neglected to reload my trusty rifle. I did not even draw my revolver, but with insensate wildness clubbed my rifle, and struck the monster over his adamant head. Contemptible idea! the stock of my rifle was shattered by the blow, and but the barrel remained in my hand. The blow I

had directed on the head of my adversary was simply reviving. It had the effect that a dose of hartshorn has in a fainting fit—it brought him to. He had been only stunned by the ball. Grim, ghastly, and bleeding, he rose to his feet and confronted me. A pang of surprise and remorse at my own gross stupidity shot painfully across my heart.

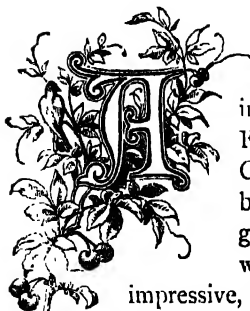
Fortunately, in that moment of horror I remained cool. With the speed of thought I had drawn and cocked my revolver and ensconced myself behind a tree. With weak and faltering steps, but still with fast renewing strength, my opponent charged down to my tree. I stepped aside, which caused him to make a slight *détour*; and at this instant I fired a chamber of my revolver. He did not drop, but raising himself on his hind legs, he threw himself upon me. I awaited him in desperate calmness, though at this moment he presented a terrific spectacle, with glaring eyes, grinning tusks, and tongue dropping foam and blood. Almost I felt his hot breath on my cheek, when I again fired point-blank at his head. The next instant a blow from his fore paw knocked the weapon from my hand; that effort, however, was his last. With trembling joy I saw his huge carcass sink to the earth, and his life departed in one indescribable growl of rage and pain.

With a thankful heart for so wonderful a deliverance, I now went to raise my poor steed to his feet, and rode into camp, where, amid many an ejaculation of astonishment, I told my tale, and exhibited my trophy in the shape of the skin, of which I had denuded my dead antagonist.

The white or polar bear enjoys a reputation for boldness and voracity. Most mariners who have been detained by the ice in the polar seas have had frequent encounters with white bears. Instances have been known in which they pursued them into their vessels, even endeavouring to make their way into cabins at night through the port-holes.

THE GRANDEST RUIN IN THE WORLD.

THE COLOSSEUM AT ROME.



AMONGST the edifices in and around the Forum in Rome, the Colosseum, which has been well named "the grandest ruin in the world," is the most impressive, both by its imposing mass and its historic interest. Though for centuries it served as a quarry, out of which materials were dug for palaces and churches, it yet stands vast and imperishable, apparently justifying the proud boast:

"While stands the Colosseum, Rome shall stand;
When falls the Colosseum, Rome shall fall;
And when Rome falls—the world!"

Its history is remarkable. After a time of civil war and confusion in the empire, Vespasian came to the throne. He, with his son Titus, used the vacant spaces which were made, partly by the fire and partly by Nero's selfish display, for raising structures, a considerable part of which still remain, the most conspicuous being that which is called the Colosseum. The place chosen was a hollow between two of the hills on which Rome stood, and where Nero had caused a lake to be made near his Golden House. The building covered nearly six acres of ground. In form it is an oval, 620 feet in length, by 513 in breadth. This colossal amphitheatre is said to have had seats for 87,000 spectators, and standing room for 20,000 more! The podium was encrusted with costly marbles; network of gilt bronze supported by stakes of wheels of ivory, guarded the spectators from the wild beasts; the spaces between the seats glittered with gold and gems; a portico carried round the entire building was resplendent with gilded columns; marble statues thronged the arcades; the awnings were of silk; marble

tripods for burning perfumes were placed throughout the edifice; and fountains of fragrant waters sprinkled the spectators, diffusing delicious odours through the air.

The subject of Christian martyrdom must ever be our chief and cherished association with the Colosseum. First in the series of Christians who were here given to wild beasts is Ignatius, bishop of Antioch. The record which is furnished to us of his route to Rome is peculiarly interesting, because he partly travelled in the footsteps of St. Paul. On his way he had written to the Roman Christians in a spirit of eagerness for martyrdom which is not altogether unlike the tone of the apostle. "I dread lest your love should do me wrong. If ye are silent about me, then I shall go to God. If ye are too eager for my bodily safety, then I must begin again the race, which now is nearly finished. Suffer me to be the food of wild beasts, that by means of them I may reach God. Nay, rather encourage the beasts on, that they may become my tomb, and leave nothing of my body: lest, after I have fallen asleep I be a burden to any for my funeral." This wish was almost literally accomplished, and very speedily after his arrival, the games for which he was destined were nearly ended, and he was hurried to the amphitheatre. "The beasts quickly despatched him, and so ravenously that only the harder and more rugged bones were left."

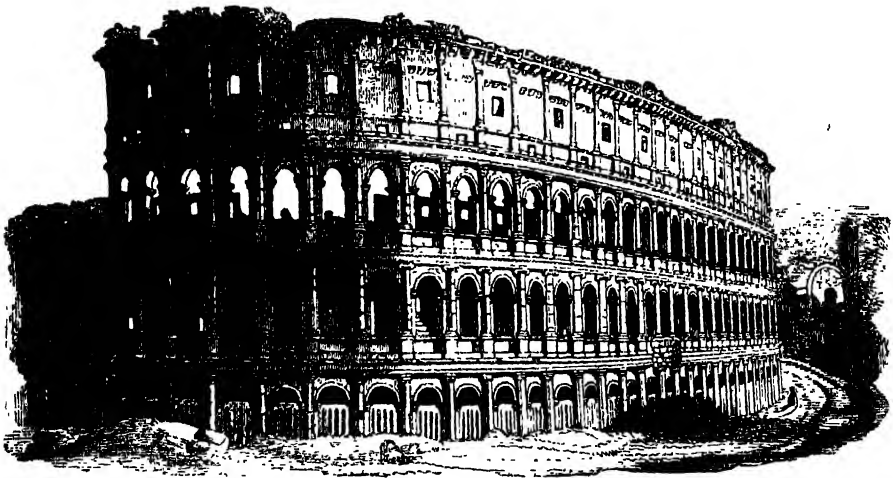
Such scenes were often re-enacted in Rome and various cities of the empire. From the time when the Emperor Decius put notices on the walls that magistrates sparing the Christians would be punished, persecution grew more general and systematic, and at intervals raged violently. "The Christians to the lions!" became a common cry in times of panic and excitement.

"And here the buzz of eager nations ran
 In murmured pity, or loud-roared applause,
 As man was slaughtered by his fellow-man,
 And wherefore slaughtered? Wherefore, but
 because
 Such were the bloody circus' genial laws,
 And the imperial pleasure.—Wherefore not?
 What matters where we fall to fill the maws
 Of worms—on battle plains or listed spot?
 Both are but theatres where the chief actors rot.

I see before me the gladiator lie:
 He leans upon his hand—his manly brow
 Consents to death, but conquers agony.
 And his drooped head sinks gradually low,
 And through his side the last drops, ebbing
 slow

From the red gash fall heavy, one by one,
 Like the first of a thunder shower; and now
 The arena swims around him—he is gone,
 Ere ceased the human shout which hailed the
 wretch who won!

He heard it, but he heeded not—his eyes
 Were with his heart, and that was far away;
 He recked not of the life he lost, nor prize,
 But where his rude hut by the Danube lay:
There were his young barbarians all at play.
There was their Dacian mother—he, their sire,
 Butchered to make a Roman holiday—
 All this rushed with his blood.—Shall he ex-
 pire,
 And unavenged? Arise! ye Goths, and glut your
 ire!"



RUINS OF THE COLOSSEUM AT ROME.

Very striking is it to note that this arena, so often drenched with the blood of Christian martyrs, is now consecrated as a church. In the centre stands a plain cross, and round the walls are fourteen shrines, before which kneeling worshippers may often be seen. In the worship thus offered there is doubtless much of superstition,—for when, in the year 1750, Pope Benedict XIV. dedicated the ruins to the memory of the Christian martyrs, he proclaimed an indulgence of two hundred days for every act of devotion performed there. But whilst lamenting the apostasy of Rome from the faith of the primitive Church, we may, nevertheless, see

an outward and visible sign of the victory of the Cross over that paganism which here erected its most imposing and characteristic monument.

But one more glance may be taken at the Colosseum before we finally leave it. The calm repose and solitude of this ruin is very impressive, when we call to mind the excited multitudes which once filled it and the hideous things which they witnessed. Nature has now patiently decked these gigantic Roman arches with an infinite variety of shrubs and flowers, so that the naturalist as well as the antiquarian finds there an opportunity for exercising his inquiry.

JAMES WATT,

THE IMPROVER OF THE STEAM-ENGINE.



JAMES WATT, the great improver of the steam-engine, was born at Greenock on the 19th of January, 1736. His father was a merchant, and one of the magistrates of that town. He received the rudiments of his education in his native place ; but his health being, even then, extremely delicate, as it continued to be to the end of his life, his attendance at school was not always very regular. Even at this time his favourite study is said to have been mechanical science. An anecdote related of him when he was about fourteen years of age, indicates the extreme restlessness and activity of his mind as a boy. Once having accompanied his mother on a visit to a friend in Glasgow, he was left behind on her return. The next time, however, that Mrs. Watt came to Glasgow, her friend said to her, "You must take your son James home ; I cannot stand the degree of excitement he keeps me in ; I am worn out for want of sleep. Every evening before ten o'clock, our usual hour of retiring to rest, he contrives to engage me in conversation, then begins some striking tale, and, whether humorous or pathetic, the interest is so overpowering, that the family all listen to him with breathless attention, and hour after hour strikes unheeded." This wonderful faculty of story-telling, which robbed the Glasgow lady of her sleep, Watt preserved throughout his life.

At the age of eighteen he was sent to London, to be apprenticed to a maker of mathematical instruments. Thus, says M. Arago, "the man who was about to cover England with engines, in comparison with which the antique and colossal machine of

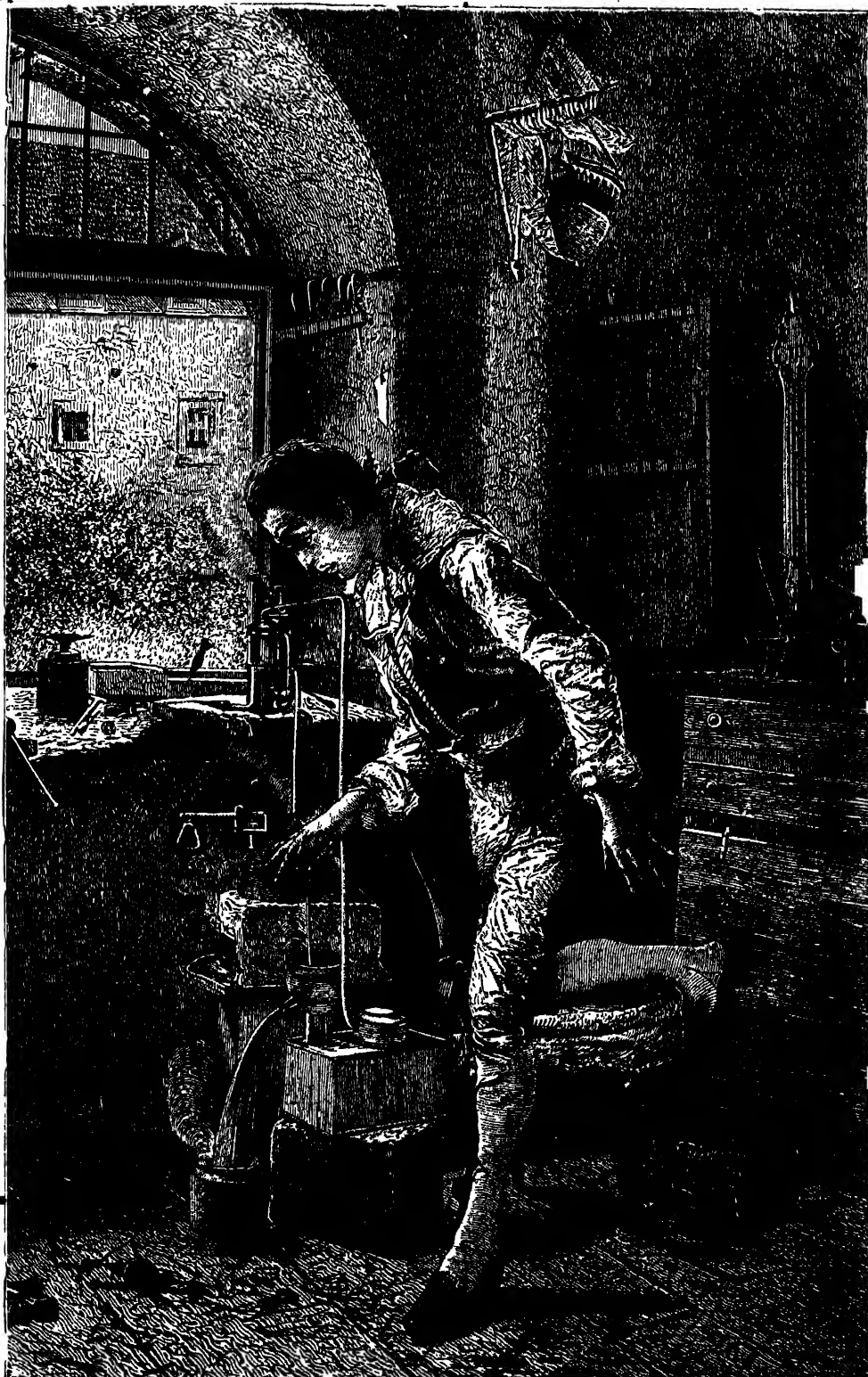
Marly is but a pigmy, commenced his career constructing with his own hands instruments which were fine, delicate, and fragile—those small but admirable reflecting sextants to which navigation is so much indebted for its progress." After a residence of little more than a year in London, his continued feeble health obliged him to return to Glasgow, where, in accordance with his own wishes and the advice of his friends, he commenced business as a maker of mathematical instruments. The date of his settlement in this city, where he was afterwards to work out some of his greatest triumphs, was 1757, when he had just passed his twenty-first year. In this situation he remained for some years, during which, notwithstanding almost constant ill health, he continued both to prosecute his profession and to labour in the general cultivation of his mind with extraordinary ardour and perseverance. Honourable, however, as his present appointment was, he probably did not find it a very lucrative one ; and therefore, in 1763, when about to marry, he removed from his apartments in the University to a house in the city, and entered upon the profession of a general engineer. In the midst of these avocations, a circumstance occurred which exercised a most important influence upon his career. In the winter of 1763-4, Mr. Anderson, the founder of the Andersonian University, Glasgow, finding that a small model of Newcomen's steam-engine, which he had among his apparatus, would not work, sent it to Watt for repair. The subject of steam-machinery had several times before come under Watt's notice. A friend had, in 1759, broached to him the idea of applying steam-power to wheel-carriages ; and in 1761-2, he had occupied himself with various experiments in order to measure the force of steam. These experiments, how-

ever, terminated in no particular result; and it was Professor Anderson's model of Newcomen's engine that begot in Watt's mind the germ of those ideas respecting the use of steam-power which have led to such gigantic consequences.

In studying this model he proceeded to take into consideration, with a view to their amendment, what he deemed the two grand defects of Newcomen's engine. The first of these was the necessity, arising from the method employed to concentrate the steam, of cooling the cylinder before every stroke of the piston by the water injected into it. On this account, a much more powerful application of heat than would otherwise have been requisite was demanded for the purpose of again heating that vessel when it was to be refilled with steam. In fact, Watt ascertained that there was thus occasioned, in the feeding of the machine, a waste of not less than three-fourths of the whole fuel employed. If the cylinder, instead of being thus cooled for every stroke of the piston, could be kept permanently hot, a fourth part of the heat which had hitherto been applied would be found to be sufficient to produce steam enough to fill it. How then was this desideratum to be attained? Newcomen's method of injecting the water into the cylinder was objectionable; it cooled not only the steam on which it was desired to produce that effect, but also the cylinder itself, which, as the vessel in which more steam was to be immediately manufactured, it was so important to keep hot. It was also a very serious objection to this last-mentioned plan, that the injected water itself, from the heat of the place into which it was thrown, was very apt to be partly converted into steam; and the more cold water was used, the more considerable did this creation of new steam become. In fact, in the best of Newcomen's engines, the perfection of the vacuum was so greatly impaired from this cause, that the resistance experienced by the piston in its descent was found to amount to about a fourth part of the whole atmospheric pressure by which it was carried down, or, in other words, the

working power of the machine was thereby diminished one-fourth.

Watt remedied the evil by a simple but beautiful contrivance—his *separate condenser*. The efficacy of this contrivance consisted in his making the condensation of the steam take place, not in the cylinder, but in a separate vessel communicating with the cylinder by a tube provided with a stop-cock. This vessel being exhausted of air, it is evident that, on the turning of the stop-cock in the tube connecting it with the cylinder, the steam from the cylinder will rush into it so as to fill the vacuum; and that this will continue until the steam be equally distributed through both vessels—the cylinder and the other. But, if in addition to being free from air, the separate vessel be kept constantly cool by an injection of cold water, or other means, so as to condense the steam as fast as it rushes in from the cylinder, it is evident that *all* the steam will quit the cylinder and enter the separate vessel, to be condensed there. The cylinder will be thus left a perfect vacuum, without having lost any of its heat by the process; the piston will descend with full force; and when the new steam rushes in from the boiler, no portion of it will be wasted in reheating the cylinder. So far the invention was all that could be desired; an additional contrivance was necessary, however, to render it complete. The steam, in the act of being condensed in the separate vessel, would give out its latent heat; this would raise the temperature of the condensing water; from the heated water, vapour would rise; and this vapour, in addition to the atmospheric air which would be disengaged from the injected water by the heat, would accumulate in the condenser, and spoil its efficiency. In order to overcome this defect, Watt attached to the bottom of the condenser a common air pump, called the *condenser pump*, worked by a piston attached to the beam, and which, at every stroke of the engine, withdrew the accumulated water, air, and vapour. This was a slight tax upon the power of the machine but the total gain



JAMES WATT EXPERIMENTING.

[From a painting by Rinaldi.]

was enormous—equivalent to making one pound of coal do as much work as had been done by five pounds in Newcomen's engine.

In addition to those difficulties which his mechanical ingenuity enabled him to surmount, Watt had to contend with others of a different nature, in his attempts to reduce them to practice. He had no pecuniary resources of his own, and was at first without any friend willing to run the risk of the outlay necessary for an experiment on a sufficiently large scale. "At length," says Lord Brougham, "he happily met with Dr. Roebuck, a man of profound scientific knowledge, and of daring spirit as a speculator. He had just founded the Carron iron-works, not far from Glasgow, and was lessee, under the Hamilton family, of the Kinneil coal-works." A partnership was formed between Roebuck and Watt, according to the terms of which he was to receive two-thirds of the profits, in return for the outlay of his capital in bringing the new machines into practice. A patent was taken out in 1769, and an engine of the new construction, with an eighteen-inch cylinder, was erected at the Kinneil coal-works with every prospect of complete success; when, unfortunately, Dr. Roebuck was obliged by pecuniary embarrassments to dissolve the partnership, leaving Watt with the whole patent, but without the means of rendering it available. At last, about the year 1774, when all hopes of any further assistance from Dr. Roebuck were at an end, he resolved to remove to Birmingham, and enter into partnership with Mr. Boulton, whose extensive engineering establishments had already become famous. The firm of Boulton & Watt commenced the business of making steam-engines in the year 1775, and almost their first business was to procure a prolongation of Watt's patent, which having commenced in 1769, had but a few years to run. It was only after a very keen opposition in Parliament that the extension of the patent for twenty-five years was obtained. At the head of those who opposed the renewal of the patent in the

House of Commons was the celebrated Edmund Burke.

The extension of the patent having been procured, the partners began to construct draining machines of the largest dimensions, which immediately supplanted Newcomen's engines in the mining districts. The bargain which the partners made with those mine proprietors who applied for permission to use the engine, was most reasonable. They stipulated to receive "a third part of the value of the coal saved by the use of the new engine." This agreement brought ample profits to the partners, as may be judged from the fact, that the proprietors of a single mine where three pumps were employed, commuted the proposed *third of the coal saved* into £2500 a year from each of the engines. Thus the saving effected by one engine amounted to at least £7500, which had been expended formerly in waste fuel. As the engine was one of large dimensions, it was scarcely possible to pirate it secretly; but so numerous were the attempts made to plagiarise it, or, by ingenious ways, to infringe the patent right, that Messrs. Watt & Boulton were almost perpetually engaged in lawsuits to defend their property. In several cases, the opposition which Mr. Watt experienced on account of his defending his rights amounted to positive persecution.

These attacks, however, failed; and in their lawsuits the partners were uniformly successful. "I have been so beset with plagiarists," says Watt in one of his letters, "that if I had not a very distinct recollection of my doing it, their impudent assertions would lead me to doubt whether I was the author of any improvement on the steam-engine." These attempts, notwithstanding successive verdicts in his favour, did not terminate till the year 1779, when the validity of his claims was finally confirmed by the unanimous decision of the judges of the Court of King's Bench. Mr. Watt's various patents expired in the year 1800. In that year, therefore, he withdrew entirely from business, leaving his share in the Soho establishment to his sons.

The last years of the life of the great engineer present few incidents worthy of notice. His health, which was extremely delicate in his youth, and liable to be affected by violent headaches, to which, he was subject, improved as age advanced, and his decline was calm and happy. He died at Heathfield, in Staffordshire, on the 25th of August, 1819, in his eighty-fourth year, and was buried in the parish church of Handsworth, where a monument to his memory, with a marble statue by Chantrey, was erected by his son Mr. James Watt. A second statue, by the same artist, was

presented by his son to the college of Glasgow. Greenock, as the birthplace of Watt, has likewise a statue of her most illustrious son; and not to mention others, the finest production of Chantrey's chisel is the colossal one of Watt in Westminster Abbey, bearing an inscription from the pen of Lord Brougham.

In one of the public squares of Glasgow—the city which witnessed Watt's early struggles—a statue has been erected to his memory; and thus has been expiated the narrow policy which originally offered an obstacle to his useful career.

AN

ADVENTURE IN CHINESE WATERS.



I WAS midshipman on board the Honourable East India Company's ship of war *Warren Hastings*, which formed one of the fleet stationed in Chinese waters when the incidents here narrated took place. We were lying at anchor a little below Whampoa harbour, or, more properly, reach, for the town of Whampoa lies about one hundred miles up the Bocca Tigris, the name of the river on which it is situated. The hour was ten o'clock in the morning of a lovely day in June, when we observed a fine large junk approaching the anchorage on the opposite side of the reach, deeply laden, and with some of the crew pulling at the sweeps or long oars they mostly carry, which, as in this instance, are used to propel their vessels in a calm. There was a group of officers standing near the "break" of the poop, discussing the latest news from England, when somebody pointed out four large row-boats pulling round a bend of the river about five miles down.

I must preface my story by informing my

readers that, in the days of which I write (many years before Sir James Hope appeared as naval commander-in-chief in China, to the terror of all Taepings and other evil-doers), there was a piratical haunt within a few miles of Whampoa; and the whole river, from that large and flourishing town to Canton, actually swarmed with miscreants who robbed everybody they could lay their hands on, and then, to prevent any tales being told, usually barbarously murdered them. Well, to return to my story. These row-boats pulled rapidly up the river until they approached within easy range of the large merchant junk, when, to our surprise, they opened fire on her from guns, one of which each boat carried in her bows. The junk returned their fire briskly from cannon, as well as jingalls and wall-pieces, or firearms resembling large muskets fitted on swivels, which most native craft in those seas carry. These she appeared to have mounted on her poop; but, as the boats still continued rowing up to her, the gunners seemed not to have got the range, their aim evidently not being very effective. This was little to be wondered at, as the

projectiles used were often only stones, for the traders were too poor to purchase iron shot.

Here was, no doubt, a case of piracy which urgently required our interference ; so, the captain being ashore, the first lieutenant gave orders to open fire on the pirates from two long brass eighteen pounders we carried aft ; but, after a few rounds, we found that the combatants were beyond the range of the guns, which were not rifled like the Armstrongs and Whitworths at present in use. Two of the ship's boats were piped away, and manned and armed in about five minutes ; each boat carrying a crew of thirteen men and an officer, with a three-pounder in the bows. The seamen had cutlasses and pistols belted round their waists ; for we proposed, if possible, to bring matters to an issue by boarding.

Soon after we got clear of the ship the pirates had boarded the junk, and all firing ceased. We gave way for the ill-fated vessel. She was about a mile and a half off, and we soon neared her, when we saw the wretches taking to their boats again. They threw their guns overboard, and laid down to their oars. There are no finer oarsmen in the world than Chinese boatmen ; and so every one who has ever visited them must allow. Our men knew what hard work was cut out for them ; but, like British tars, they gave one cheer and bent to their oars, making the spray fly over us. The race was most exciting ; for the pirates were well aware what would be their probable fate if captured red-handed from their bloody work. Not a word was spoken by the boats' crews as they strained and sweated at the long ash oars ; but they felt they were on their mettle, and were determined to overtake the fugitives. We gained on them, without doubt ; but there is a naval proverb, "A stern-chase is a long chase : " and, besides, they had a start of us about three-quarters of a mile.

"Give way, men !" "That's the stroke !" "We'll have them yet, my lads !" were the few words of encouragement spoken by the officers in charge, and the coxswains bent

their bodies in unison with the sweep of the cutters' oars. Ah ! the miscreants at last see it is a losing game, and point their heads for a part of the shore not far from their haunt. The blue-jackets give one cheer at this intimation of defeat, and, if possible, redouble their efforts. We head them off the bank of the river, where their friends are no doubt assembled in large numbers to assist and applaud them, and they make for the opposite shore, whither we also pursue them. The coxswain, a true Milesian, whispers in a voice hoarse with excitement, "Sure it's all up with thim now, sir !" Presently, at the word of command, our two bowmen threw their oars inboard, and the gun, being loaded with grape-shot, is carefully aimed from the stern-sheets by the second lieutenant, who seizes the tiller ; and, at the order "Fire !" the trigger-line is jerked, and the contents discharged right into the knot of row-boats. The shot takes some effect, for three oars in one of the boats are smashed. For a minute the pirate crew of the injured boat lay on their oars, and the man in charge seems to be soliciting the others to stop and fight it out, since they cannot all escape. But *sauf qui peut* is the word, and the three others make off at their best speed, and leave their unfortunate comrades to their fate.

We leave her to be dealt with by the other cutter, which is slightly astern, and gave way for one of those unscathed, but whose crew seem to be waxing faint from the terrible exertion, for their boats are heavier built than ours. The one we are in pursuit of, as a *dernier ressort*, doubles back like a hare in coursing ; but for this we had been prepared, and our coxswain, who was also "captain of the fore-castle," and a regular old salt up to this kind of game, clapped his helm hard down, and we lost nothing, but rather gained by the move. The two other pirate boats had by this trick of their ally's got a considerable distance ahead, and made across to their own side of the river, and, as soon as they were out of all personal danger, commenced a desultory fire on us with their jingalls, and

matchlocks. A few of the balls struck the boat, and one spent bullet grazed a man's arm, but no harm was done; when, think-

ing "discretion the better part of valour," the pirates with all speed ran their boats ashore and gave up the contest.



CHINESE PIRATICAL JUNKS.

Suddenly the pirates we were in chase of turned like a wild boar at bay, and, throwing aside their oars, took to their matchlocks and daggers. We, "following mo-

tions," dropped the oars, the boat carrying way enough for the coxswain to steer alongside our opponent. The Jacks, with a hurrah, drew their cutlasses in their right hands,

and, with their heavy old-fashioned pistols in their left, prepared to board. We mustered fifteen, officers and men, and the pirates, we afterwards discovered, had about eighteen men in each of their craft. Now ensued a short but desperate hand-to-hand tussle, all the incidents of which it would be vain for me to attempt to narrate, for my attention was fully engrossed. Our men were ordered to resort to extremities, unless, of course, they threw down their arms and sued for mercy. This last was not likely; for, as it was their habit to show no mercy, they expected none. Previous to the encounter two of our sailors were hit by their fire, one seriously in the leg; but the rest all boarded as they best could, after discharging their pistols into the enemy. I tried to follow suit; but, being hustled, missed my leap and tumbled into the water, and by the time I had recovered myself the *mêlée* was over. Fortunately I could swim; but, although possessing that accomplishment, I was nearly drowned; for one wretched Chinaman caught me tightly by the hand as he was sinking in a death-grip, and dragged me with him under the water a second time. I called out, and attempted, but in vain, to shake him off, when one of the sailors, watching till we rose to the surface, made him relax his hold, and he sank to rise no more.

When, much exhausted, I succeeded in getting into the cutter again, the combat was over, and our casualties consisted of one man mortally wounded by a stab in the chest, and two others dangerously, and one slightly wounded. This made a total of six men hurt—a rather serious matter out of fifteen. On inspection we found that four of the Chinamen were killed, two drowned, and five wounded. We soon had the remainder properly secured, and took the boat in tow. About this time—for the whole affair only lasted a few minutes—the other cutter neared us, towing her prize, and the officer in charge informed us that his opponents had thrown down their arms and yielded themselves prisoners, in the most craven manner supplicating for mercy.

The leader seemed an effeminate young man, evidently new to the trade, with less of the tiger in his features, and quite a contrast to the pirate in command of our prize, who was a grizzled ruffian, with a peculiarly brutal cast of countenance. The Tartar type of physiognomy is seldom attractive, and the long eye, slanting down towards the nose, with the high cheek-bones, generally gives a cruel and sinister look to the ordinary Chinaman, which was much aggravated in the expression conveyed by the features of the lawless desperadoes with whom we had been dealing. The other boat's crew stated that there was a slight attempt at resistance on the part of some of the pirates before they closed with them; but it was only in a half-hearted manner, and was soon overcome, though not until one of the number, who jumped overboard and tried to make his escape by swimming, was fired at. The coxswain was slightly wounded, and the officer in charge received a bullet on his sword-hilt, which was completely broken.

The first thing after bandaging up the wounded was to man the prizes; and, as the tide was setting in against us, and drifting us to where the two other pirate boats' crews had landed, we were getting anxious, and were just going to burn them, so as to prevent their falling into the enemy's hands, when two of the *Warren Hastings'* boats hove in sight, who, on coming up, took these craft in tow, while we directed our attention to the merchant junk which was the cause of all this "tumasha," and which was drifting towards us. The surgeon had been sent to look after the wounded, and had brought his assistant and his operating instruments; and, the old frigate being a long way off, he thought we could not do better than transfer the wounded to the junk, where there would be more space available. She was approaching us, carried with the tide, no one at the helm, and her sails flapping idly against the masts.

When we boarded her, what a sight met our gaze! There were twenty-four dead and dying Chinamen, and two women both

dead, lying about the decks weltering in their blood. The pirates had put them to the sword before taking to their boats; and the poor creatures, who were harmless traders between Hong Kong and Whampoa, had thus met a shocking death. There was no hope for the recovery of any of them, and, before we reached our ship, the wounded had all breathed their last. The poop and lower deck, as well as the cabin in which lay the murdered women, were slippery with blood, and presented a ghastly sight. We threw the dead overboard, washed the decks down, and made sail on her, and also got the sweeps to work. The prisoners were put to some use by manning them, and were made to understand that, if they did not "give way," they would meet with the same fate as their victims; for, with such a sight before our eyes, we did not feel over-scrupulous as to showing them mercy, all claims to which we considered they had forfeited. They obeyed sullenly, and their stout arms, well accustomed to handle the long sweeps, made good progress through the water.

But our difficulties were not to end here. The wind began to freshen from ahead; and although we were only about two miles from the *Warren Hastings*, yet we knew the pirates were very strong in these waters, and we were fearful of an attempt at recapture by their friends in overwhelming numbers. The mainmast, which had been struck in three or four places by bullets, fell with a crash just at this juncture, carrying, of course, the mainsail with it; so, after a short consultation among the officers, the determination was arrived at to distribute the prisoners and wounded among the four boats, and, after abandoning and destroying the junk and row-boats, to make the best of our way home. This was soon carried out, and the ill-fated vessel was presently in flames fore and aft, and we began to pull back.

The sky looked black and lowering, and distant thunder warned us, with the quickly increasing wind, of an approaching gale or typhoon. A good deal of valuable time

had been lost in the vain attempt to tow the captured boats, and a strong tide had now set in against us. The air was hot and oppressive, and our men were faint with their great exertions, although they had been supplied with food and water by the boats which came to our assistance. Presently a signal-gun from the *Warren Hastings* indicated that our immediate return was desired. We pulled inshore, therefore, to get out of the current, and kept a sharp look-out on the long reeds which skirt the river, and which, we supposed, might harbour a concealed foe. Nor were we wrong in our conjecture, for our "stroke oar" descried a certain suspicious waving of the jungle that induced us to pull out again more into the middle of the stream. Most fortunate it was we did so; for, in a few minutes, a large number of natives appeared on the margin of the river, and fired a volley, but without effect, howling execrations on us at the same time.

As our object was to get the poor wounded sailors on board as soon as possible, the better to relieve their hurts, and as no good could come of landing our fatigued men for a fight in these unexplored swamps, we let them enjoy their triumph, and shout and fire to their heart's content, and used every exertion to make the ship, which at length we accomplished, the seamen thoroughly exhausted.

The prisoners were all put in irons or handcuffed, and a guard placed over them, and the wounded well taken care of. We all felt we had done a good day's work; and the boats' crews, after having "spliced the main-brace" (had an extra glass of grog) and returned their arms, were "piped below." The poor young fellow who had been mortally wounded in the conflict had died as we were returning after having abandoned the junk, and his body was buried with all due solemnity the following morning.

There was a large Imperialist fleet of war-junks lying within half a mile of us higher up the river; but, with their usual supine-

ness and want of energy, the admiral in command did little towards putting down the pirates who committed such atrocities with comparative impunity under his very august nose, and within twenty miles of Canton itself.

Of course our captain informed him on the next day of the steps we had taken, and delivered over our prisoners, twenty-eight in number. We had hardly left them under his charge when the tide brought some headless trunks past our ship; and,

oddly enough, the body of our ferocious friend, who commanded the boat with which we had been engaged during the morning, got athwart our chain-cable, and there remained until it was pushed off by a boat-hook.

The surgeon had, on the following morning, to amputate the leg of one poor fellow who had been hard 'hit, and he died from the effects of the operation; but the remainder of our wounded recovered, and soon returned to duty.



THE DIVING-BELL.

ONE of the most useful inventions of modern times, perhaps, is the diving-bell. By its aid the construction of sub-aqueous works, such as the foundations of piers and bridges, has been much simplified; and in raising sunken vessels, in recovering lost treasure, and in submarine works generally, it is much used. Many sub-aqueous undertakings, in fact, are now rendered possible, which, without its aid, could not even be attempted. The principle of the diving-bell is mentioned, though obscurely, by Aristotle, who wrote about 325 B.C.; and so long ago as 1538 one was used at Toledo, in Spain, when two Greeks descended a considerable depth into the water, in the presence of Charles V. and a host of spectators. This bell was nothing but a very large kettle, suspended by ropes, with the mouth downwards, and planks to sit on placed in the middle. Halley (about 1721) greatly improved this machine, and was, it is said, the first who, by its means set his foot at the bottom of the sea. Dr. Halley's bell was a wooden chamber, open at the bottom, where it was loaded with lead, to keep it perpendicular in its descent.

Light was admitted through strong pieces of glass. Casks filled with air, and weighted, were let down with the bunghole downwards, from which air was drawn into the bell by a hose. The next great improvements introduced into its construction were by a Mr. Spalding, of Edinburgh, who had paid particular attention to Dr. Halley's bell, and had constructed one for the purpose of recovering some property from a ship wrecked on the Fern Islands, in 1774. Mr. Spalding's first experiments were made in shallow water, in Leith Roads. He then took his bell to the river Tay, near Dundee, where a vessel laden with iron had been lost in about two fathoms of water. Here he went down three different times, and at last fell in with the stump of the wreck. He found that the muddiness of the river occasions a darkness at only two fathoms from the surface that cannot be described; and from the smallness of the machine, which contained only forty-eight English gallons, it was impossible to have a candle in it. The men, too, whom he had engaged, refused to work. "Convinced from this," he says, "that with an open boat nothing could be accomplished, and that, except in June and July, no man would risk himself with me in a sloop, to continue a few days and nights at anchor there, I was obliged to

abandon my project; yet I determined to take a view of the guns of a Dutch ship of war lost in the year 1704; and as they lay two or three miles nearer the land, I could execute this design with less difficulty, especially as the weather continued still favourable. Having procured all the intelligence possible, we went to the place, where I went down four different times, but could find no marks of any wreck, notwithstanding my walking about in five and six fathoms water, as far as it was thought safe to allow the rope to the bell, continuing generally twenty minutes each time at the bottom. On this occasion I was obliged to carry a cutting hook and knife, and clear away the sea weeds, which at this place are very thick and strong; without this method I could not move about. At the fifth going down, each trial being in a different place, I was agreeably surprised to find a large grove of tall weeds, all of them from six to eight feet high, with large tufted tops, mostly in regular ranges, as far as the eye could reach, a variety of small lobsters and other shellfish swimming about in the intervals." He then discovered the place where one of the cannons lay, but was too exhausted to bring it to the surface.

To obviate the danger of the bell sinking too fast, and so either burying its inmates within it, or upsetting by coming in contact with some projecting object, Spalding introduced a large balance-weight suspended below the bell, which, when it reached any rocky or uneven ground, settled down first, and then the bell, being made too light to sink without the weight, remained suspended and free from danger.

The contrivances described above, however, were very primitive affairs compared with the highly finished machines of the present day. The great engineer, Smeaton, much improved upon them, and in 1779 used one in repairing the foundations of Hexham Bridge; and with even greater success a few years afterwards in the construction of Ramsgate Pier, where, in the course of two months, by its aid 160 tons of loose stone were raised from the ground.

Smeaton's bell, however, was square, and composed partly of iron and partly of wood. It was $4\frac{1}{2}$ feet in height and length, and 3 feet wide, affording room for two men to work in it; and these men were provided with a constant supply of fresh air by means of a forcing pump placed in a boat, which floated above them. This was lighted by stout pieces of bullseye glass, firmly cemented in brass rings near the top.

The principle of the diving-bell is very simple, and can be illustrated by a very easy experiment. Place a match or a lighted candle on a cork, cover it with an inverted tumbler, and press it straight downwards into the water. The light will continue burning, even though the tumbler be entirely immersed. The air in the tumbler, not being able to escape, remains in it, and prevents the water from occupying its place, so that the light, though still on the floating cork, continues surrounded by the air in the tumbler. It will, therefore, continue burning until the oxygen in the air is exhausted, when it will, of course, be extinguished.

The modern diving-bell is circular. It is generally made of cast iron, and air is pumped from above into it. A considerable quantity of air has thus to be forced into it, merely to keep it full as it descends. When it has reached its full depth, the pumping is continued only to supply oxygen for respiration, and the superfluous air comes out at the bottom and up to the surface in great bubbles. A seat is provided for the workmen, and the bell is suspended from a crane or beams projecting over the water. Men are stationed above to work the pumps, and attend to the signals of the diver. These signals are made by striking the side with a hammer, and as water is a good sound-conductor, they are easily heard above. If the diver wishes for more air, he strikes one blow; two blows mean "stand fast"; three, "heave up"; four, "lower down," etc. Messages are also sent up by a label attached to a cord. "The sensations produced in descending are rather curious. Immediately on the mouth of the diving-bell striking the water, a feeling like a slight

blow on the internal ear is produced; a dull ringing in the ears and a sense of deafness follows. The workmen accustomed to subaqueous existence do not suffer these inconveniences; novices feel pain in the head and ears, but these pass away after a short initiation. It is stated that one man who had suffered from difficulty of breathing was completely cured by 'belling,' and that deafness is not produced by it, but, on the contrary, is in some cases relieved. The diving-bell, of course, has its perils, though accidents are very uncommon. In 1783, a party who went down on the coast of Ireland were all drowned, by some defect in the air-supplying apparatus, which allowed the water to enter the bell.

One noble family, at least owe their present importance to the diving-bell. In 1683, William Phipps, the son of a blacksmith, formed a project for unloading a rich Spanish ship, which had been sunk off the coast of Hispaniola, in the West Indies. He applied for assistance to the Government, and, in the hope of sharing in the recovered treasure, he was furnished by Charles II. with a ship, and everything necessary for the undertaking. Phipps sailed for the West Indies, but was unsuccessful

in bringing any gold to the surface, and returned to England in deep poverty. The Government had by this time had enough of him, and all his supplications for another ship met with a refusal. A subscription, however, was got up on his behalf, and in 1687 Phipps again set sail, in a ship of 200 tons, having previously undertaken to divide the profits which he might make according to the twenty shares of which the subscription consisted. This time, by the aid of a diving-bell, he was more fortunate, and recovered so much treasure that he returned to England with £200,000 sterling. Of this sum he got about £20,000 for his own share, and his chief patron no less than £90,000.

But at length Phipps was knighted by the king, and from him descended the house of Mulgrave, afterwards, in 1838, raised to the Marquisate of Normanby. The example set by Phipps of the use of the diving-bell has been much followed. The *Royal George* man-of-war, which was sunk off Spithead in 1782, was surveyed in this manner in 1817; and much property is frequently recovered from the wrecks of vessels which have been lying for many years rotting and useless at the bottom of the ocean.

HUNTING THE HIPPOPOTAMUS.



REPORT of a most exciting kind may still be had by adventurous spirits tired of the old-fashioned methods.

In the course of his explorations of the River Shire, in the search for Livingstone, Lieutenant Young came upon a party of hippopotami hunters called Akombwi, and arrived just in time to see a most exciting display of their courage and

skill in capturing these denizens of the Shire marshes. "There were not less than twenty harpoons sticking into a half-grown hippopotamus; and his exertions to tear himself away from the men who were hauling him bodily ashore were truly frightful. To add to the effect, another huge animal, exasperated at his sufferings, dashed boldly in and crushed up one of the canoes as if it had been a bundle of matches.

"I do not know that there is anything in the way of sport that requires such consummate courage and coolness as their mode of hunting. The hunter has to trust entirely

to his activity with the paddle to escape the jaws of the animal, and a touch from the monster upsets the frail canoes as easily as a skiff would be capsized by a touch from a steamer. It requires, in fact, that the harpooner should keep his balance exactly as he stands in the bow of his long slim canoe,

and that during the utmost excitement. The moment the weapon is lodged in the hippopotamus, he has to sit down, seize his paddle, and escape, or he is instantly attacked; nor is the next stage of proceeding less fraught with danger.

It now becomes necessary to get hold



A NARROW ESCAPE.

of the pole, which floats on the water; the iron head of the harpoon, which has come out of its socket, remains attached to this pole by a long and very strong rope. The hunter hauls upon this till he knows that the hippopotamus is under water, just 'up and down' beneath his canoe. To feel for the moment when the line suddenly slackens,

—a sure sign he is rising to the surface, —and to prepare to deliver another harpoon the instant his enormous jaws appear with a terrible roar above water within a few feet of him, is about as great a trial of nerve as can very well be imagined. Constantly are the canoes crushed to atoms. The only escape then is to dive instantly, and gain

the shore by swimming under water, for the infuriated animal swims about, looking on the surface for his enemies, and one bite is quite enough to cut a man in two. When I add, where the presence of blood in the water is the sign for every crocodile within hail to lick his lips and make up stream to the spot, I am sure it recommends itself as a sport to the most enthusiastic canoer in England, or the most *blasé* sportsman, who had 'done all that sort of thing and got sick of it,' in the common routine of English sports. The Akombwi will show him more pluck in half an hour, and more exercise of muscle, brain, and nerve, than in any sport I ever saw.

"As a race, the men are magnificent. To watch the evolutions of their canoes, as they pass and repass over the deep pools in which hippopotami lie, is a very beautiful sight. Each canoe is manned by two men; and the harpooner's attitude, as he stands, erect and motionless, with the long weapon poised at arm's length above his head, would make the painter or sculptor envious of a study. Hard exercise and activity develop every muscle; and the men, as a rule, have the most magnificent figures. They are as generous as they are brave. They lead a wonderful life, living mostly on the rivers, establishing villages for a year or two in one place or another, where families build huts and cultivate a patch of ground. The flesh of the hippopotami they kill is always eagerly exchanged for grain by the natives along the river; and the curved teeth, the hardest of all ivory, find a ready market with the Portuguese."

A somewhat clumsy but effective trap is also used by the natives of equatorial Africa to catch the hippopotamus. Knowing the paths taken by the animal on leaving the river to go along the bank, they hang in a thicket, with the help of long poles kept in equilibrium, a stake terminated in a steel point. The hippopotamus, in traversing the thicket, deranges the poles, and the

sharp instrument, falling from a great height on the animal's head, kills or wounds it so seriously that it can easily afterwards be approached and despatched.

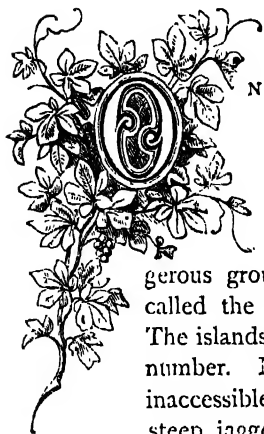
Dr. Livingstone had many narrow escapes from these infuriated animals. On one occasion he had taken a trip up the Rovuma, accompanied by Captain Gardner, commander of the *Orestes* man-of-war, and several of his officers. On their return they met with a very irascible hippopotamus, that followed the boat, came up under it, and then tried to tear the bottom out of it, but fortunately it was too flat for his jaws to get a good grip; so he merely damaged one of the planks with his tusks, though he lifted the boat right up with ten men and a ton of ebony in it.

This was a narrow escape; but a much more perilous affair happened to Lieutenant Vidal, when ascending the river Temb  in his boat. On a sudden a violent shock was felt from underneath, and a monstrous hippopotamus reared himself up from the water, and in a most ferocious and menacing attitude rushed, open-mouthed, at the boat. With one grasp of its tremendous jaws it tore several planks from the side. The creature disappeared for a few seconds and then rose again, apparently intending to renew the attack, but was fortunately deterred by the contents of a musket discharged in its face. Being near the shore, the crew in this instance all escaped.

An amusing anecdote is related by Mr. Baines of a hippopotamus accustomed to pass to and from the water by a particular path, being watched and sprung upon by a lion which attempted in vain to tear his impenetrable hide. The hippopotamus swerved not from his course for a single moment, but, making for the river, walked imperturbably to its depths and floated off the lion, whose struggles to escape from the element to which he had been so unceremoniously introduced were plainly seen by the spectators on the bank.

THE HEROINE OF THE FARNE ISLANDS.

GRACE DARLING.



N the extreme north of the Northumbrian coast, some twenty-five miles south-east of Berwick, are a dangerous group of rocky islets called the Farnes or Ferns. The islands are twenty-five in number. Many of them are inaccessible, and bounded by steep jagged precipices; and through the narrow channels between them the sea rushes with irresistible force. In former times, when no lighthouse flashed its warning signal across the waves to warn the benighted mariner from these treacherous shores, many an unrecorded shipwreck must have happened here, many a poor sailor, bound for some Scotch or Northumbrian port, have found a grave,—

"Unwept, unhonoured, and unsung."

A small monastery and cathedral once stood on the principal island, Farne, dedicated to St. Cuthbert, patron saint of Durham, who here lived a hermit life, and died towards the end of the seventh century. Of this saint many legends were told. The Danes having invaded the islands, the monks fled to Melrose, in Scotland, carrying the body of Cuthbert with them; and it was gravely reported that finding himself unable to rest on Scottish soil, he sallied forth in search of a more congenial resting-place, and sailed southward, in his stone coffin, till, after many wanderings, he chose his wild seat where the huge cathedral of Durham, dedicated in his honour, looks down upon the Wear. On the beach are found many curiously perforated stones, not unlike beads; and these were supposed to have been made by the saint during his

hours of loneliness on the island, and were hence, and are still, called "St. Cuthbert's beads."

"On Lindisfarne

St. Cuthbert sits, and toils to frame
The sea-born beads that bear his name."

Here, cut off from all human society, save the casual visits of pilgrims anxious for his blessing, some poor fisherman from the adjacent mainland, or, more rarely, of some shipwrecked sailor, cast bleeding but alive at his feet, Cuthbert, in his cell, and afterwards, for centuries, the few monks and nuns in the Benedictine monastery, spent their weary lives in the hope of finally escaping an eternal doom. The roaring of the winds and the waves, and the harsh scream of the sea-birds, with at times the cry of distress from some poor drowning wretch in his last agony, were the chief sounds that could reach their ears. A more dreary and desolate scene it is scarcely possible to imagine. Mr. Howitt, writing of a visit to Longstone, one of the Farnes, says "Longstone, like the rest of these desolate isles, was of whinstone, cracked in every direction, and worn with the action of the winds and waves. Over the greater part of their surface not a blade of grass, nor a grain of earth; it was bare, and iron-like stone, crusted round all the coast, as far as high-water mark, with limpet and still smaller shells. We ascended wrinkled hills of black stone, and descended into worn and dismal dells of the same; into some of which where the tide got entrance, it came pouring and roaring in raging whiteness, and churning the loose fragments of Whinstone into round pebbles, and piling them up in deep crevices with seaweeds like great round ropes and heaps of fucus. Over our heads screamed hundreds of hovering birds, the

gull mingling its hideous laughter most wildly." On this lonely rock, set in the midst of the everlasting ocean, lived one William Darling, who succeeded his father as keeper of the light on the Brownsman, the outermost of the Farne islands. This was before the days of the lime or electric light; and dioptric, catoptric, or catadioptric reflectors, with all the rest of the apparatus by which our coasts are now protected, were then things unknown. The lighthouse in Darling's charge was not at all like the magnificent structure which now crowns the Eddystone, or the still finer buildings on the Skerryvore, or the Bishop and the Bell rocks. Before lighthouses on the modern principle were built, large iron baskets filled with burning wood or coal were used as signals. In rough weather, of course the keepers had hard work to keep their light burning. A fire basket of this kind was shown from Tynemouth Castle in 1638, and one was in use at St. Bees, in Cumberland, so late as 1822. The system was probably many centuries old. In 1826, Darling was appointed keeper of the Longstone lighthouse, and here Grace, his seventh child, spent her girlish years. She is said to have been a "pleasant child." Happy and contented in the society of her brothers and sisters, and in helping her mother in the domestic duties of the little household, and seldom visiting the mainland, she had little opportunity of enjoying the customary pleasures of young people of her age, and probably cared little for them. Her father was a quiet, intelligent man, and instructed his children to the best of his ability. Grace had reached her twenty-second year when the incident occurred which has rendered her name so famous.

On the evening of Wednesday, the 5th of September, 1838, the steamer *Forfarshire*, Captain Humble, sailed from Hull on her voyage to Dundee. She had on board 41 passengers, 20 seamen, the captain and his wife, and a valuable cargo. From the beginning she met with a succession of storms. When off Flamborough Head, it was found that the boilers leaked so much

that two of the fires were extinguished, but after partial repair they were relighted. The next evening, while the sea was running high, and the wind blowing strong from the north, the leakage again appeared and put out the fires. Two men were employed to pump water into the boilers, but it escaped through the leak as fast as they pumped it in. About 10 o'clock she bore up off St. Abb's Head, the storm still raging with unabated fury. By this time the engines were entirely useless. The vessel was now in a most critical position. There being great danger of drifting ashore, the sails were hoisted fore and aft, and the vessel was put about, in order to get her before the wind. But all the efforts of the crew were unavailing. She soon became unmanageable, and drifted helplessly to the south with the swiftly-rushing tide. It rained heavily during the whole time, and the fog was so dense that it became impossible to tell their situation. At length breakers were discovered close to leeward, and the Farne lights, which now became visible, left no doubt as to the imminent peril of all on board. Captain Humble attempted to avert the catastrophe by running the vessel between the islands and the mainland; but she would not answer the helm, and was driven to and fro by a furious sea. At length the crash came. About 3 o'clock in the morning, the horror of the darkness increased by the howling of the wind and the drenching rain, she struck with her bows foremost on the sharp jagged rocks at a spot where they went sheer down a hundred fathoms deep or more.

The scene on board, as may be imagined, was now of the most awful kind. Thinking only of saving their own lives, some of the crew lowered the larboard quarter boat, and quickly cut adrift from the ship. Just as they were pushing off, one of the passengers, a Mr. Ritchie, rushed upon deck, partly dressed, and seeing the chance of escape, flung himself into the boat. His uncle and aunt, attempting to follow his example, fell into the boiling sea, and perished in his sight. The boat was no more heard of.

Piteous cries for help went up from the despairing crowd. The captain's wife, clinging to her husband, frantically besought the protection he was powerless to give. Very soon after the first shock, a gigantic wave struck the vessel on the quarter, and lifted her bodily from the rock. Down she came crashing upon the sharp edge, which fairly cut her in two pieces, the after part, containing the cabin with the captain and his wife, and many passengers was instantly carried off through a tremendous current called the Pipa Gut—considered dangerous even in good weather—and swamped; while the fore part remained on the rock. At the moment the steamer parted amidships eight or nine of the passengers and a few sailors betook themselves to the highest part of the deck by the windlass. In the fore cabin, exposed to the dashing waves, was Mrs. Dawson, the wife of a weaver, with her two little children. When relief came, life was found trembling in the bosom of the poor woman, but her two little ones lay stiffened corpses in her arms!

Benumbed and exhausted, the weakest of the forlorn party on the rock were one by one swept from their hold; the survivors, nine in number, remained in their dreadful position till daybreak, fearful that every rising surge would sweep the fragment of wreck on which they stood into the deep. A mist hovered over the island; and though the storm had somewhat abated, the sea, which even in the calmest weather is never at rest amongst the gorges between these iron pinnacles, still raged fearfully. Darling, as usual, was on his look-out from the Longstone lighthouse, nearly a mile distant, and with the aid of the glass descried the poor creatures clinging to the wreck. The weather was still so bad that, accustomed as he was by a lifelong experience to storms and tempest, he hesitated to put off to the wreck. With the exception of his wife and daughter he was the only person at the lighthouse; to brave the perils of that terrible passage, needed strong arms and well-tried nerves. The tender heart of Grace was torn with anguish at the sight of

the perishing beings. At her earnest entreaty her father consented to attempt the rescue. With the mother's help the boat was launched, and father and daughter, each taking an oar, started on their errand of mercy. Slowly but surely they neared the rock; and when they reached it, great care and caution were needed to prevent the boat from being stove in by the sharp ridges of the rock just showing above the heaving billows. Their efforts were crowned with success, and the nine sufferers were safely rescued. The feelings of the poor castaways, as they saw the boat approaching, cannot be described. As the night wore on, and the little party gradually lessened its numbers, they had given up all hope. It was as life from the grave; and they could not express their amazement when they saw that one of their deliverers was a female!

The sufferers were safely landed at the lighthouse, where, owing to the heavy seas, they were obliged to remain from Friday morning till Sunday. A boat's crew that came off to their relief from North Sunderland were also obliged to remain. Grace gave up her bed to poor Mrs. Dawson, whose sufferings were intense; the others were made as comfortable as kind hearts and hands could possibly make them. With tears of gratitude to their deliverers, the forlorn little party left the lighthouse, as soon as the storm had abated, and proceeded on their journey.

The news of Grace's daring action spread far and wide, and the lonely lighthouse was soon the centre of attraction to many. Her name became a household word all over Europe. Numbers of testimonials were sent her, and a public subscription was raised for her benefit. Amidst all this applause, she never forgot the modesty which became her sex and station. She found her happiness in assisting her beloved parents, and continued to reside at the lighthouse.

It may be supposed from the nature of the deed that Grace possessed great bodily strength. This was not the case; she was

naturally rather delicate. A few months after the wreck of the *Forfarshire*, consumption set in, her health gradually declined, and to the great regret of all who knew her, she peacefully passed away on the 20th of October, 1842. The following verses have been written upon this noble action :—

The clouds on the ocean scowled,
Flushed with a stormy red ;
And the angry billows rose on high,
And back to the dark and wrathful sky
Tossed their defiance dread.

And the surge of the awful wave,
And the foam of the boiling sea,
Cresting the billows fierce and white,
Curled o'er a steamer bound that night
For the harbour of brave Dundee.

Woe for the trembling crew,
Drenched with the blinding spray !
Ye whom the spoiler shall not part,
Folding each other heart to heart,
Nought may ye do but pray.

Hark ! from the doomed ship
The shriek of her living freight !
For the hidden rock, it hath rent her sore,
And the breakers are telling with sullen roar
Of the homes made desolate.

High on the lighthouse tower,
Father and daughter brave
Marked off the rocky isles in sight
The nine who had weathered that stormy
night,
Battling with wind and wave.

And the maiden's great warm heart
Swelled in her dauntless breast :
"Oh, to the rescue haste !" she cried ;
But the old man gazed on the raging tide
Hopeless, and sore distress.

She hath won with her urgent plea !
Yes, on that morning wild,
Over the seething, roaring waste,
Bound on their holy mission, haste
Father and fearless child.

The arch of the great green wave
Bent the light bark above.
What with its awful might could cope ?
Oh, 'twas not higher than woman's hope,
Stronger than woman's love.

Now in the billow's trough,
Now on its crest on high,
Calmly the maiden plied her oar,
Fearless of ocean's dash and roar,
As the light tern floating by.

Clinging to rope and spar,
Her coming the shipwrecked see,
Praying her skiff the storm may brave
To Him who silenced the maddened wave
On the Lake of Galilee.

The cormorant croaked above
From the heights of his island home ;
And the scream of the sea-bird heard afar
Answered the thrilling, wild "Hurrah !"
That rose 'mid the breakers' foam.

'Mid the warfare of wind and wave,
And dash of the blinding spray,
That chilled not her hope, nor hand, nor heart,
Nobly the maiden played her part,
Winning the hard-fought day.

Seaman and maiden brave,
This is life's proudest hour !
Now while the billows roar and chafe,
Gaze on the lost ye rescued—safe !
Safe in your lonesome tower !

Swiftly the tidings flew
Of the heroine's deed of love ;
And her courage ten thousand bosoms stirred,
And the name of "Grace" was a household
word,
Dearest, all names above.

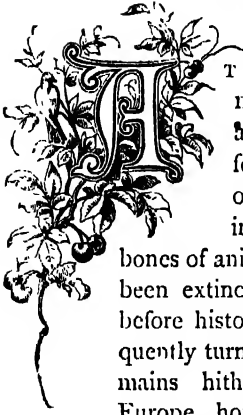
They offered her gems and gold ;
But hers was a richer meed—
The peace that soft in her bosom slept,
And the tide of wealth to her heart that
swept
Back from the generous deed.

She is lying and sleeping now
Under the verdant turf.
Ah, there were breakers she might not ride !
And her hair grew damp in that strong, dark
tide,
But *not* with the briny surf.

And out of her lonely grave
She bids us this lesson prove,
That the weakest may wipe some tears that
flow,
And the strongest power for good below
Is the might of unselfish love.



MARVELLOUS MAMMOTHS.



AT various times the remains of antediluvian animals have been found in various parts of the world, notably in Siberia, where the bones of animals whose race has been extinct for a period long before historical record are frequently turned up. All the remains hitherto discovered in Europe, however, dwarf before the size of the Mammoths which once inhabited California, and whose bones are to be seen at this day near Cañon City. They are thus described:—A few more steps, and we are at the tent, and all within and without are heaped-up bones (rocks now), many of them so perfectly agatized that at a casual glance it would stagger belief that they were ever covered with flesh. As seen here, however, it is so palpably apparent that the seeming rock and agate are bone, as to leave no room for shadow of doubt. Before us are perfect parts of huge skeletons; sections of vertebra three feet in width; ribs fifteen feet long; thigh bones over six feet in length. In one pit, the diameter of the socket of the vertebrae measured fifteen inches; width of spinal process, forty-one inches; and depth of vertebrae, twenty-nine inches. In another place there was a thigh bone six feet and two inches in length; a section of backbone lying just as the monster rolled over and died, with eleven ribs attached, the backbone twenty feet long, and from sixteen to thirty inches deep, and the ribs five to eight feet in length and six inches broad. Just showing upon the surface was a part of a thigh bone, twenty-two inches in width and thirty in length, and near it a nine-foot rib, four inches in diameter, a foot wide at six feet, and where it articulated with the

vertebrae, twenty-three and one-half inches in width. The entire rib was fifteen feet in length. All over the hill we come upon little piles of broken bones, which will require days of patient labour and skilful handling to properly set in place.

The first discovery of the fossils was made by a young graduate of Oberlin College, and in a short time two parties were duly equipped, and engaged in excavating, setting up, and preparing for shipment, the bones. The first animal discovered was of entirely new genus and species in scientific circles, and was named the *Camarasurus supremus*, from the chamber or caverns in the centrum of the vertebrae. Of the first petrifications exhumed was a thigh bone six feet in length, a shoulder-blade five-and-a-half feet long, and a sacrum, or the part of the backbone over the hips—corresponding to four vertebrae united in one—forty inches. Prof. Hayden, the chief of the United States Geological Survey, upon visiting this place and inspecting the parts of this animal, declared his conviction that the beast must have been fully a hundred feet in length! The thigh bone, measuring some six feet, stood over the hips eighteen to twenty feet. The animal was undoubtedly shorter of front than of hind legs, and Prof. Marsh thinks it had the power to rise up like a kangaroo on its hind legs, and browse off of the leaves of the trees from sixty to eighty feet in height. The “critter” seems to have fed entirely upon grass and leaves, the vertebrae of the neck being some twenty-one inches in length. Between 7,500 and 8,000 pounds of bone have been already shipped to Boston and other cities.

A part of the jaw of a *Celaps trihedron*, ten inches long, and containing eight teeth, varying from five to eight inches in length, has also been shipped. Recently a leg-

bone of this same animal was exhumed, and found to measure a little over four feet. A part of the femur of another animal has been found, measuring six feet, but somewhat lighter than the others. The vertebræ are three feet six inches in elevation, showing a very tall but not so heavy a brute as the *Camarasurus*. When found, it was lying on the right side, with vertebræ and

ribs of that side in place, the ribs measuring over six feet in length, and the prongs where they join the back fifteen inches in width. Many of the bones of the *Camarasurus* are misplaced and broken up, quite a pile being found at the spot where several of the teeth of the trihedron were discovered, thus indicating the preying of the other.



THE MINE UNDER THE SEA.

AT the south-western extremity of England, surrounded on three sides by the sea, stands a rough, rugged promontory, about eighty miles in length, whose extreme western terminus is appropriately named Land's End. Stretching along the western coast of Land's End for three or four miles, is the mining district of St. Just, long celebrated for the peculiar position of its mines, among perpendicular rocks, and extending far beneath the sea. The village of St. Just is about seven miles from Penzance—a town of note in Cornwall—and commands a fine view of the British Channel. All around, the land is barren and the scenery wild; and towards the cliffs of Botallack it grows wilder and more barren. Here, on a shore exposed to the full fury of the ocean, and among steep granite cliffs, towering to a height of more than sixty feet above the water, is the famous Botallack Mine—perhaps the most wonderful in all the world.

Looking up from the sea, upon the very summit of the craggy cliff, you catch glimpses of various apparatus, almost overhanging the restless waters. The gloomy precipices of slate and granite, which have successfully defied the ocean waves, are cut into winding pathways, broken up by mining tools, and dotted with all manner of com-

plicated machinery. Smoking chimneys and puffing engines indicate a hidden power; chains and pulleys lead to unknown depths; on one side of the cliffs, tall ladders enable the miners to ascend—and a sure foot and a strong head must be needful to tread those ladders, round by round, with the roaring sea beneath! The entrance to the Botallack mine is near the foot of one of the lofty, jutting cliffs; but it is no easy matter from the heights, to gain even the mouth of the shaft; and to descend perpendicularly into the dark abyss, hundreds of feet below the level of the sea, and horizontally thousands of feet beneath the bottom of the ocean, requires not a little firmness of nerve and power of endurance.

The workings of the Botallack Mine—long famous for its tin ores, more recently for copper—are extended between one and two thousand feet below the ocean level, and from the depths of the land, galleries have been carried out under the depths of the sea not less than 2,300 feet. Such submarine burrowing is wonderful and romantic. That men can labour in dark caverns, under the rolling ocean, digging mineral wealth from rocks above which waves are dashing in storm-driven fury, is marvellous. Even in fine weather, the rattling of pebbles with the swell of the ocean can be heard in the caverns of the mine, with greater distinctness than on the beach itself; and during heavy storms the

noise is so appalling that, although no real danger is apprehended, the workmen often feel a strange terror creeping over them. Many years ago, while the miners were following the small veins of tin scattered through the rocks of this submarine mine, they actually penetrated to the Atlantic Ocean; but the hole made was speedily plugged up with the handle of a pickaxe; and to the present day the waters are kept out of the mine by a wooden wedge wound with greased oakum.

Standing near that strange place, with only a few feet of rocky partition between the mine and the bottom of the ocean, a terrific rumbling reverberates from gallery to gallery, and the boulders, rolling over each other on the bed of the sea, sound like distant thunder. Salt water oozes through the granitic ledges, and during tempests, the miners sometimes feel a continuous sprinkling of sea-water. That plugged portion of the roof is richer in metallic ore than any other part of the mine, it is said; but no workman, even if impelled by hope

of untold wealth, would dare venture to cut out another pound near the danger-lurking spot.

Every visitor in Cornwall is curious to see this far-famed mine, which exhibits such singular combinations of the power of art and sublimity of nature. Moreover, it is exceedingly interesting to learn by actual observation the methods by which two of our most valuable metals—tin and copper—are extracted from their hidden beds. Both these metals have been known from remote antiquity, and are mentioned frequently in the Old Testament. From the most ancient times Cornwall has produced tin in great quantities, and early historians allude to the extensive traffic carried on in this article. Centuries ago, the Phœnicians, the Greeks, and the Romans, visited Cornwall to obtain tin.

Doubtless it was chiefly because the ore has been found, until comparatively recently, in but few countries in workable quantities, that the ancient Cornwall mines gained a world-wide fame.

THE

EARLY HISTORY OF THE STEAM ENGINE.



LIKE most of the great "inventions" of modern days, the principle of the steam engine was known, in its rudimentary form at any rate, from a very early date. The first description of the application of steam as a mechanical power occurs in the writings of Hero, a Greek of Alexandria, who lived in the third century before Christ. This writer describes a toy called the Eolipile, the purpose of

which is to produce a rotatory motion by the action of steam. The best familiar illustration of the appearance of such an apparatus in one of the simplest forms, would be one of those turnstiles, with four horizontal spokes, which are sometimes placed in by-paths. Were one of these revolving stiles made of iron, and hollow throughout, with a hole in the corresponding side of each of the spokes, and were the upright shaft to be fixed into a socket beneath, entering a boiler, then the steam rushing up the shaft and along the four spokes, would hiss out in four jets at the side openings, and the whole would, owing

to the force of reaction, whirl round in the opposite direction. Here, therefore, nearly two thousand years ago, we find steam applied to produce a rotatory motion. By connecting the simple rotatory apparatus above described with additional machinery, mills could be driven, and other important mechanical effects produced. The principle of the Eolipile, however, and of the rotatory engines which are modifications of it, is evidently different from that of steam-engines usually so called, in which the power consists not in the mere reaction caused by steam violently escaping into the atmosphere, but in the prodigious expansive force of steam itself.

But even this use of the expansive force of steam was in some degree known to the ancients. In the images of the ancient gods were sometimes concealed crevices containing water with the means of heating it: and tubes proceeding from these crevices conducted the steam, so as to make it blow out plugs from the mouths and foreheads of the images with loud noise and apparent clouds of smoke. A more ingenious device still, and which represents the utmost extent to which the ancients carried their use of the expansive force of steam, is one described by Hero, the purpose of which seems likewise to have been priestly imposition.

In order to accomplish this trick, Hero directs vessels half full of wine to be concealed inside of two figures, in the shape of men standing on each side of an altar. From these vessels, tubes, in the form of bent syphons, with the short end in the wine, proceed along the extended arms of the figures to the tips of their fingers, which are held over the flame of the sacrifice. Other tubes proceed from the same vessels downwards, through the feet of the figures, communicating through the floor with the altar and the fire. 'When, therefore,' says Hero, 'you are about to sacrifice, you must pour into the tubes a few drops, lest they should be injured by heat, and attend to every joint, lest it leak; and so the heat of the fire, mingling with the

water, will pass in an aerial state through these tubes to the vases inside the figures, and, pressing on the wine, make it to pass through the bent syphons, until, as it flows from the hands of the living creatures, they will appear to sacrifice as the altar continues to burn.'

From the time of Hero down to the beginning of the seventeenth century, no advance appears to have been made in the application of steam power.

A French engineer, named De Caus, published a folio volume, in 1623, on moving forces, in which he came very near the modern steam-engine. De Caus's steam invention is a modification, in a more patent and distinct form, of the last-mentioned artifice of Hero. A hollow copper globe is filled to the extent of two-thirds or thereby with water, through a funnel-shaped pipe, which enters it, and which is furnished with a stop-cock. Besides this pipe, another descends nearly to the bottom of the globe, so as to have its termination beneath the water. It is likewise furnished with a stop-cock, and its nozzle is small. If now the vessel be placed over a fire, with the stop-cock of the first pipe shut, and that of the other open, it is evident that when the water begins to boil, the steam, being inclosed, will press down the water, and compel it to rush up the second pipe, forming a jet.

Forty years after the appearance of this book, came the celebrated Marquis of Worcester's "Century of Inventions." In this work he describes "an admirable and most forcible way to drive up water by fire, not by drawing or sucking it upward," but by a method according to which "one vessel of water rarefied by fire driveth up forty vessels of cold water." What value the marquis attached to this invention, appears from the striking language he uses with regard to other modifications of it. Of one he says, "I call this a semi-omnipotent engine, and do intend that a model thereof be buried with me." From his description, it would seem that he had really constructed an engine, and there is not much doubt

that the Marquis of Worcester must be regarded as the first person who really constructed a steam-engine.

Although, however, it would thus seem that steam-power was in actual operation so early as 1656, it is not till 1699, upwards of thirty years after the Marquis of Worcester's death, that we find the steam-engine again pressed on public notice. In that year Captain Savary exhibited a model of an engine for draining mines, and raising water to great heights. The difference between this and the invention of the Marquis of Worcester consisted in this, that whereas "the marquis's model appears to have been placed on or below the level of the water to be raised, so that the water was forced up solely by the elastic force of the steam, Savary, on the other hand, erected his engine at a height of nearly thirty feet above the level of the water." The improvement of Savary, in fact, consisted in combining the force of atmospheric *suction*, as it is usually called, with that of steam pressure.

Like De Caus, the next great improver of the Steam Engine was a Frenchman. Denis Papin, who had made a great name by other important mechanical inventions, conceived the idea of making the steam-power act through *the cylinder and piston*. In De Caus's and in Savary's apparatus the steam pressed directly upon the surface of the water; but Papin conceived the idea of introducing the steam into the bottom of the receiver, so as to force up, by its elasticity, a tightly-fitting plate or piston, which would again descend by the pressure of the atmosphere as soon as the steam beneath was condensed. The importance of this modification can hardly be overrated, when it is considered that it amounts to the application of steam-power to produce the motion of a rod up and down in a cylinder. This was the great step, the conciliation of steam, as it were, into a regular moving power at the command of man; and, as M. Arago observes the procuring afterwards, from the strokes of the piston, the power to turn millstones, or the paddles of a steam-boat, or to uplift

the massive hammer, or to move the huge clipping shears—these were but secondary problems.

Improvements in the Steam Engine now came apace. In 1711, Matthew Newcomen and John Calley, mechanics, of Dartmouth, availing themselves of an idea which had been thrown out by a French engineer, adopted the modern plan of cooling the steam by the injection of a stream of cold water. The old mode of effecting this was by the removal of the fire! These two individuals constructed a machine which was meant to raise water from great depths, and in which there was a distinct vessel where the steam was generated. This machine, like the small model of Papin, consisted of a vertical metallic cylinder, shut at the bottom and open at the top, together with a piston accurately fitted, and intended to traverse the whole length, both in ascending and descending. In the latter, as in the former apparatus also, when the steam was admitted into the lower part of the cylinder, so as to fill it, and counterbalance the external atmospheric pressure, the ascending movement of the piston was effected by means of a counterpoise. Finally, in the English machine, in imitation of Papin's, as soon as the piston reached the limit of its ascending stroke, the steam which had impelled it was refrigerated; a vacuum was thus produced, and the external atmosphere forced the piston to descend. The only novelty in Newcomen's engine, over and above what had existed either in Papin's or in Savary's model, was the mode of condensing the steam in the cylinder. This was effected not by simply withdrawing the heat from the bottom of the cylinder, as Papin had done, nor by dashing cold water on the outside of it, as in Savary's apparatus, but in directing a stream of cold water into the inside of the cylinder at every rise of the piston. This improvement—an important one at the time—is said to have been made by accident, from the circumstance of water once finding its way into the cylinder through a hole in the piston, and astonishing the onlookers by

its results. The injection of cold water was accomplished by two stop-cocks, which were turned by hand: the first, for the admission of steam from the boiler; the second, for the admission of the cold water for the condensation of the steam. The whole action of the machine depended on the attention of the person who watched these two cocks. A curious accident, however, remedied this inconvenience. A boy of the name of Humphrey Potter being employed to tend one of Newcomen's engines, belonging to Mr. Beighton, found the constant watching so troublesome, that he set himself to contrive a way by which the cocks might be turned at the right time, and yet he might enjoy himself for an hour or so at a time with the boys in the street. Observing that the particular moment at which the valve required to be opened for the admission of the steam was that at which the pump-rod end of the beam was raised to its highest, and that the moment at which the other cock required to be opened was when the piston-rod end was at its highest, he saw that, by attaching

strings to the stop-cocks, and connecting them with various parts of the beam, the rising and falling of the two ends would turn the cocks regularly as was necessary. Such was the *scogging* or *skulking gear* of the boy Potter; so called because it enabled him to *scog* or play truant from his work, and afterwards improved by the substitution of rods for strings. The Steam-Engine was now entirely self-working; the only attendant necessary was the fireman to tend the furnace. Newcomen's engine was very successful, and is well known in Cornwall to this day. After Newcomen's time, little was done for some time to improve the steam-engine, till Mr. Beighton, in 1718, made the machine itself shut and open the cocks by which the supply of cold water was regulated, instead of having this service performed, as before, by an attendant. This, as we have said above, was discovered by a boy. This was a great step, and was to lead to further developments under the hands of the famous Watt, whose improvements of the Steam-Engine will be found narrated elsewhere.



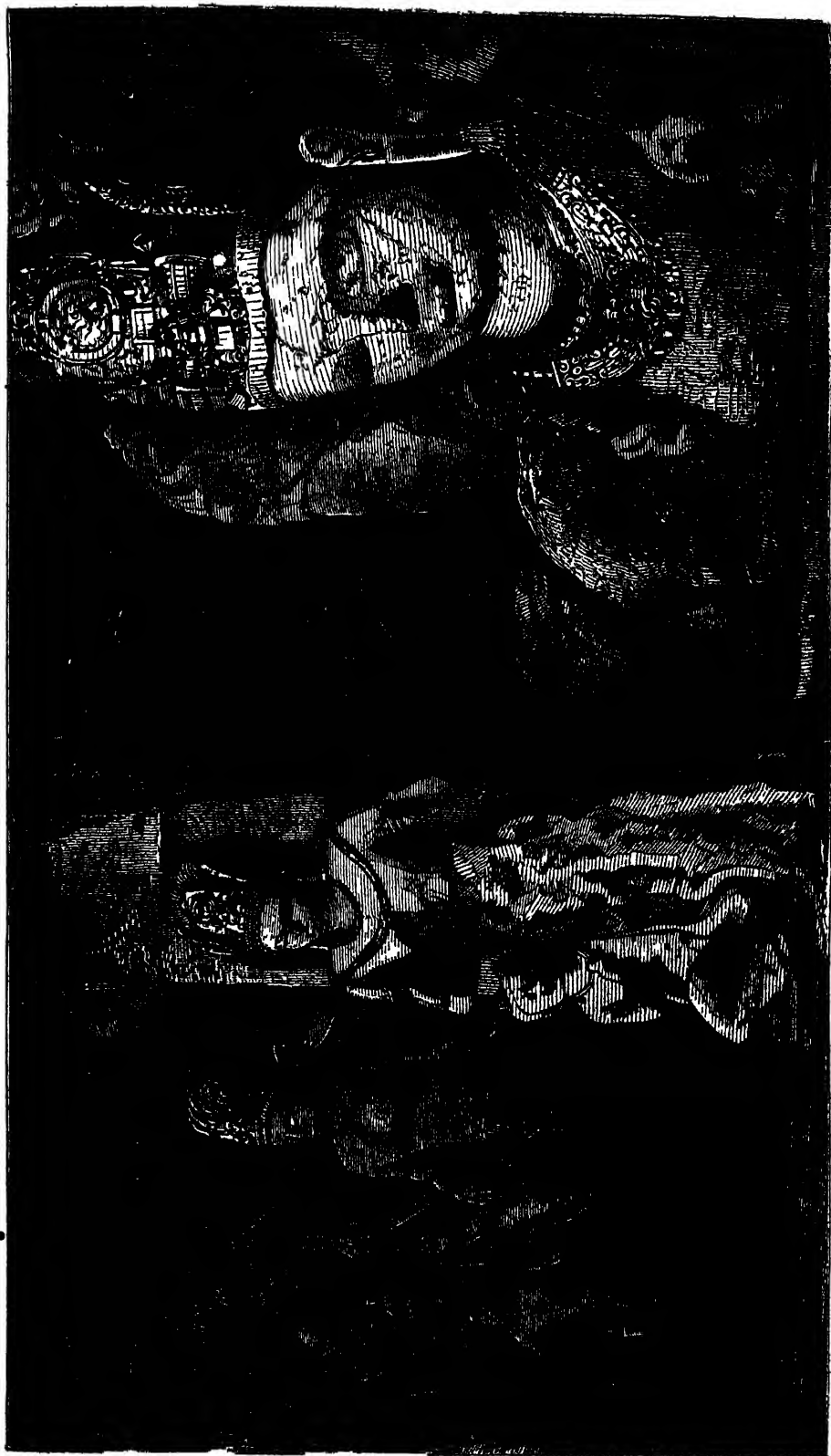
THE WONDERFUL CAVE TEMPLES.

THE renowned cave temples of Elephanta are situated on an island in Bombay harbour, called Charapuri by the natives. The caves are three in number, hewn from the solid rock, and constitute a Brahminical temple, some say to the Hindoo Trinity of Brahma, Vishnu, and Shiva, the Hindoo supreme god, and source of all being and power.

The temple, which derives its European name from the figure of an elephant which formerly stood near the entrance, is situated in the centre of a huge hill, which rises abruptly from the island, and may be seen for miles round. The great cave measures

about 130 feet long, is about as broad, and is from 15 feet to 17 feet high. It is reached by a long flight of steps reaching from the shore, and is cut out of the solid rock, a work evidencing the patience and perseverance of the excavators, who not only cut out the rock, but designed beforehand, and left in the proper place, every separate pillar, every block for a statue, and every compartment. Subsequently came the more delicate artists to portray in the recesses the avatars of the presiding deity, Shiva.

The entrance is flanked by two enormous columns; but the temple is in a very ruined condition. Out of twenty-six columns which originally supported the cave, only eighteen remain, and these are much mutilated. At the end is the *trimurti*, or bust of a 'three-



STATUES OF UR AND FIGURINE AT CAVE AT

headed figure, eighteen feet high, representing the Hindoo Trinity above mentioned—*i.e.*, Brahma the Creator, Vishnu the Preserver, and Shiva the Destroyer. To the right and left are the small caves, where are various sculptures and representations of Shiva: such as his marriage, the deity in his double character of male and female, as the Destroyer, as the Ascetic, etc., besides numerous other sculptured illustrations of Hindoo mythology. One design bears so great an affinity to the story of Solomon's judgment, that we are half tempted to believe it records that most Oriental decision: a not very improbable conjecture, either, when we remember how deeply his memory is still revered in the East, as the chief of magicians and hero of all miraculous deeds.

In addition to this there are several other, but less important, caves on the island. In the course of his trip to India, the Prince

of Wales paid a visit to this remarkable spot. After inspecting the interior of the largest cave, which was lighted with pyramids of oil lamps arranged in three lines, and various chandeliers, the Prince dined at a table placed just beneath the bust of the huge three-headed idol, upon whom the sacrilegious hands of unbelievers had fixed innumerable lamps. Notwithstanding the thousands of lights, a dim religious gloom pervaded the cave, and the effect is described as grimly theatrical. After viewing the two smaller caves by the light of green and red fires, the Prince left the temple and re-embarked. Outside was a blaze of light; on the top of the hill gleamed a huge bonfire and fireworks, lines of white, red, blue, and green lamps led down the sides, while the ships in the harbour were illuminated from stem to stern, and saluted the royal steamer as she passed with portfires and thousands of rockets.

WONDERFUL TREES.



AMONGST the greatest curiosities of the American Continent are the gigantic trees found in the Mariposa Valley in the State of California. A recent traveller graphically describes his visit to them:—

"The road led through a vast forest, with a dense undergrowth of flowering shrubs which made the air heavy with their fragrance. The pines and redwood, which had been increasing in size ever since we left the plain, now assumed gigantic proportions. Again and again as I approached some forest giant, I asked, 'Is that one of the big trees?' But it was only a redwood, attaining not more than the contemptible height of two hundred feet! At length the grove was reached, and all that I had heard of these

monarchs of the forest fell short of the reality. For their size I was prepared, but their beauty took me by surprise. The lines of the trunk reminded me of those of the modern lighthouses,—a broad base, from which rises an exquisitely tapering shaft, perfectly smooth and straight, to a height of two hundred or two hundred and fifty feet, when a vast crown of branches is thrown out, many of which are as big as an ordinary tree. Unlike the redwood, to which they are allied, they only grow in detached clumps or groves. Their *habitat* is on terraces varying from five to seven thousand feet above the level of the sea. The scientific name by which these trees have been known in England is *Wellingtonia gigantea*. This, however, seems to have been given in mistake, under the erroneous idea that they formed a new species. Really they are a variety of the redwood or *Sequoia*, which grows abundantly and attains an

immense height on the mountain ranges of California.

"The most important of the trees are named and numbered,—the Mother of the Forest, the Three Graces, Maid of Honour, Daniel Webster, Richard Cobden, Henry Ward Beecher, and so on. One, which has fallen and lies pointing to the south, is called after Andrew Johnson, the late ex-President of the United States, on account of his southern proclivities." The tallest ~~tree~~ actually measured is the Keystone State, which is three hundred and twenty-five feet high. One tree, numbered three hundred and thirty, was originally over one hundred feet in circumference at the base. Another, though one side has been burnt away, still measures ninety-three feet round the base. A calculation of the age of the trees, by counting the annual rings, was made by the Geological Survey. Having selected one which was deemed suitable for the purpose, it was felled by means of augers and wedges, a task which occupied five men for twenty-two days. The stump, at six feet from the ground, had a circumference of about ninety feet. A very careful counting of the rings, gave its probable age as one thousand years. As this tree was in full vigour, it may be fairly assumed that those which show signs of decay are much older."

The following is the account of another traveller who came upon these monsters of the forest more suddenly:—

"Sure enough there stood a red-barked monster dwarfing the large trunks among which it grew, as a full-grown tree does a crowd of saplings. Where were our pines, with their eighteen feet girth, by the side of a giant some one hundred feet round, breast high! Of course, the great size of the ordinary forest timber in which these huge growths are found, takes off from their immense proportions; but if one were set upon a plain, it

would show like the Eddystone Lighthouse. It was hard to realize that what we saw were trees. Their trunks, when we stood close to them, had almost the appearance of artificial structures. One that had fallen was hollow, and had been broken by its fall. We rode into the break, and through the prostrate fragments, as if it had been a tunnel. We climbed upon the trunk of another, also fallen, and when I had stepped fifty-five yards along it, I measured its circumference, and found it to be over twenty-five feet. Thus, with its bark on,—it had been stripped,—it would have been at least some thirty feet in girth, at a height of one hundred and seventy feet from the ground. But these were not the largest that we saw. The bark of these trees is red, and nearly a foot thick. It lies on the trunk, in rough longitudinal ridges like huge muscles, but so soft that with my pocket-knife I cut off two great trunks from a portion which had been detached and lay upon the ground. The branches are short, and spring mainly from the upper part of the tree. The foliage is scant in proportion to the trunk, and the cones no bigger than plovers' eggs. The tree itself is said to be a species of cedar; but it spends its strength in growing more wood than leaves. There are about six hundred of these cedars, of different sizes, some being comparatively small, in the Mariposa groups. I do not know the greatest height reached by any one of these, but in another grove, the altitude of one is found to be three hundred and thirty-five feet; and there also, a fallen trunk can be ridden through on horseback for a distance of twenty-five yards."

It is only necessary to add that as these trees are now carefully protected by the United States Government, they are likely to remain for ages to gratify the curiosity of the traveller.

CURIOUS FREAKS OF NATURE.

THE SIAMESE TWINS.



In fashioning the "human form divine," nature sometimes makes sad mistakes. Occasionally two persons are so united in bodily structure as to be inseparable. The most remarkable instance of this peculiarity is in the case of the well-known Siamese Twins. These men, named respectively Chang and Eng, were born in May, 1811. They were of short stature, Eng being 5 ft. 2½ ins. high; Chang being about an inch shorter. They had excellent health throughout life, and possessed good muscular development. The band that united them sprang originally from the lower portion of each breastbone, and kept them face to face; but their efforts during childhood to attain a more convenient position, produced some bending of the structures concerned, so that they stood shoulder to shoulder, in which position they usually crossed their adjacent arms behind each other's backs. When necessary, however, as at meals, they could bring both arms forward without inconvenience. The band itself was about four inches in length, and more than seven inches in circumference in the centre, and rather more than three inches deep at its junction with each body. The nerves of each brother passed a little beyond the middle of the band, so that a touch was felt by both over a central portion about an inch in width, beyond that portion only by the brother who was touched. The blood vessels in like manner communicated, but there was no interchange of blood between the two; and experiments showed that chemical agents introduced into one body had no appreciable effects upon the other. The hearts of the two brothers were distinct, and even

somewhat unlike, and the respiration was wholly independent of each other. Their mental operations were entirely distinct too, and in playing chess against an adversary, they consulted one another about the next move. Their original resemblance, the necessities of their position, and the fact that their experiences must have been absolutely identical through life, combined to bring them into an extraordinary degree of concord in thought and action; but into no greater degree than may be thus accounted for. It was plainly their study, and became their second nature, to act in harmony in all things. They moved as if by one impulse and without verbal communication, and rarely talked to each other. But each would feel the other's impulse to move before a bystander could detect it. They took pleasure in all sports that could be pursued in concord. They took no pleasure in sports that would place them in opposition, as in playing games of chance or skill against each other, although perfectly capable of playing such if they cared for them. These interesting twins died a few years ago, within an hour of each other.

Among the most remarkable twins united after the fashion of the Siamese, and who have survived their birth, were two girls described by Dr. Berry, who lived to be seven years old. The drawing which he gives of them shows them to have been healthy, good-looking, and active. Food taken by the one, nourished the other; but they were different in character, and one sometimes woke while the other slept.

Of twins who have lived united *back to back*, the best known instance is that of two Hungarian sisters, Helen and Judith; they were born in 1701, and died at Presburg, in 1723, aged twenty-three. Some disorders they had separately; others, as measles or

small-pox, together. Judith sank under disease of the head and chest. Helen, who preserved her health well till the last, felt her own strength suddenly fail, and after a brief struggle, she died also. Sir James Simpson saw, in 1856, two female children, Amelia and Christina, then five years old, united exactly as Helen and Judith. They were born in South Carolina. Although

united back to back and completely fused, they were very different in disposition. When they quarrelled more bitterly than usual, they backed at each other with their elbows. They ran and walked with facility, one backwards and the other forwards, and, notwithstanding their partial community of body, one was sometimes seen to eat while the other was almost asleep.

SURF-RIDING IN HAWAII.



THE Hawaiian's wonderful feat of surf-riding has become world-renowned. Taught to swim, sometimes before he can walk, he is a perfectly amphibious creature. The children play for hours at a time in the surf; indeed, it is difficult to say how long a Hawaiian could remain in the water. On the *papa-hee-nalu*, or surf-board, the native will surmount billow after billow with wonderful dexterity; standing, sitting, or lying at full length on a plank (about six feet long and two feet wide, with rounded corners) he rides old Ocean's huge billows as easily as the jockey rides his horse.

The harbour of Hilo is well adapted for the sport. Its beach is a mile and a half long, and lies in a semi-circle; upon it the breakers' roar is deafening, and in a storm, the waves pound upon it with appalling fury.

Taking definite shape far from land, they sweep across the bay, leaping as they fly, and tossing spray from their crests. No craft nor human being could live a moment in such a sea, one would say; and yet it was with just such a sea running that all Hilo turned out to see the surf-riders, for the rougher the sea the finer the sport. Depositing their clothing upon the sand-bank, the bathers plunged into the surf. For the privilege of coming in upon a wave,

they must swim far out beyond the line of breakers, and this a native does with the utmost ease by simply diving under each wave. A wave never retards his outward progress nor gives him an unexpected slap in the face.

We watched the heads appear and disappear with every approaching roller, and the rapidity with which the natives swam out against the incoming sea was wonderful. It seemed no effort whatever; and yet the wind was blowing a gale, and ships in the harbour could hardly hold their anchorage.

At from half a mile to two miles away the surf-riders turned their faces shoreward and "lay-to." One after another enormous billows came plunging along, under which the swimmer disappeared only to reappear and wait for a larger; for only the largest and most turbulent wave gives one a fair start and carries its passenger to the shore.

And now comes a "comber," tearing through the water like an infuriated animal. At a short distance the native sees it, and instantly he is transfigured: every fibre of his being is alive with the intensity of the moment. He is like a cat watching its prey, for he must make as instantaneous a spring, to be caught and borne along by that ingoing swell: one second too late and it will drop him behind. Just as it begins to curl above his head and he feels its lifting force, there is a motion, quick as lightning, and our surf-rider is lying full-length

on his board, head downward, in *front* of the wave, and travelling at the rate of forty miles an hour. With inconceivable dexterity he keeps his *papa-hee-nalu* in position; *always* in front of the wave, and pointed well downward, he is propelled by the pressure upon the underside of the board.

The wave in its progress picks up passenger after passenger, and as it approaches the shore, fairly hurling its daring riders forward, the wild enthusiasm of the spectators breaks forth in ringing huzzahs; the shouts almost drown the roar of the surf; and how the wild scene makes one's blood tingle! The uninitiated grow breathless with suspense,

for they expect to see the natives dashed upon the beach by the breaking wave, more dead than alive. Not at all! The latter seem to know by instinct when the billow will topple over, and that moment they bring their *papa-hee-nalus* into a horizontal position and drop behind it, and when the mountain of "cruel, crawling foam" has spent itself at your feet, the surf-riders are several yards out to sea again. If in need of rest, they take it in the water, coming to land when the day's sport is over. They land high and dry with an incoming wave—always without accident, though completely submerged by the breaker.



A WONDERFUL PRECIPICE.

THE gorges in the mountains of the eastern states of America are called cañons, and some of them are of immense proportions. One of these, the "Royal Gorge" of the Grand Cañon of the river Arkansas, in Colorado, is thus described:

'The solemn stillness of death pervades the scene—the height is so great that the water below one is as polished metal, and as stationary as the mighty walls which look down upon them from such a fearful eminence. Fairly awed into a bravado as reckless as it is strange to us, we crawl out upon tottering ledges to peer into sheer depths of untold ruggedness; we grasp with death-like clutch some over-hanging limb, and swing out upon a promontory beside which the apex of the highest cathedral spire in the world would be a sapling in height. If our first experience upon the brink of the Grand Cañon was startling, this is absolutely terrifying, and the bravest at the one point become most abject of cowards in comparison at the other. At the first

point of observation, the walls, though frightfully steep, are nevertheless sloping to more or less extent; here at the Royal Gorge they are sheer precipices, as perpendicular as the tallest house, as straight as if built by line. So narrow is the gorge that one would think the throwing of a stone from side to side the easiest of accomplishments, yet no living man has ever done it, or succeeded in throwing any object so that it would fall into the water below. Many tourists are content with the appalling view from the main walls, but others more venturesome work their way six hundred to a thousand feet down the ragged edges of a mountain that has parted and actually slid into the chasm; and as we have come to see it all, the clamber down must be accomplished. For some distance we scramble over and between monstrous boulders, and reach the narrow and almost absolutely perpendicular crevice of a gigantic mass of rock, down which we must let ourselves a hundred feet or more. As we reach the shelf or ledge of rock upon which the great rock has fallen and been sundered, we glance back, but only for a second—the thought of our daring making us grow sick and dizzy. But a step or two more, and

the descent just made sinks into utter insignificance compared to what is before us. Then we had the huge walls of the parted rock as the rails of a staircase; now we have nought but the smooth, rounded surface of the storm-washed boulders to cling to, and, on either side of our narrow way, depths at the bottom of which a man's body could never be discovered with human eye. Behind us, the precipitous rocks over and through which we came; ahead of us, the slender barrier of rock overhanging the appalling chasm, and all there exists between us and it. Few dare to look more than once, and one glance suffices for a comprehension of the meaning of the word "depth" never before even dreamed of, and never afterwards forgotten. The gorge is 2,000 feet sheer depth, the most precipitous and sublime in its proportions of any chasm

on the continent. The opposite wall towers hundreds of feet above us, and if it were possible to imagine anything more terrifying than the position on this side, that upon the other would be, were its brink safe to approach. Overhanging crags, black and blasted at their summits, or bristling with stark and gnarled pines, reach up into profoundly dizzy heights, while lower down monstrous rocks threatened to topple and carry to destruction any foolhardy climber who would venture upon them. The cañon, except in the dead of winter, is approachable only from the top, the walls below being so precipitous and the river such a torrent as to defy all access. When frozen, as the waters are for brief periods during the coldest months, the way up the cañon may be accomplished, but only at the risk of personal comfort and not a little danger."



THE CITY OF THE SULTANS.

HERE is no lovelier, few so lovely, scenes on earth as that which unfolds itself to the traveller as he approaches Constantinople from the sea; above all, on one of those days of early summer when the bitter blasts from the Euxine have ceased to blow, and the south wind, warm from Syrian deserts, tempered in its course by the snows of Olympus, chases the last few fleecy clouds away from the bright blue sky. Before him, as the anchor drops in the still depths of the Golden Horn, rise on the southern side of the long inlet the seven low hills of old Byzantium—a maze of domes and minarets, masses of cypress groves and clusters of tumble-down old houses, Ottoman mosques and old Byzantine towers and pillars, still

girdled round by the same ancient walls, albeit sadly dilapidated now, which in the days of archers and Greek fire so often baffled the repeated attacks of Goth and Bulgar, Persian and Arab, and even the all-conquering Osmanli himself.

On the northern bank, above the crowded buildings and Genoese Tower of old Galata, appear the heights of Europeanised Pera, gay with official residences of ambassadors and *chargés d'affaires*, the home of rumour, speculation, and intrigue. Facing the city, on the Adriatic shore, are Scutari, with its groves of tombs, the largest, the most beautiful, the best beloved of all the cemeteries of the capital, and Kadi-Keui, now a little village, once known to fame as Chalcedon, "city of the blind." Whilst onwards to where the Castles of Europe and of Asia frown at one another across the narrowest part of the Straits, and the expanse of the gloomy Euxine is divined rather than seen beyond, stretch eastwards—beginning with



TURKISH LADY, IN OUTDOOR DRESS.

Tophanèh, the site of the Imperial cannon-foundry and artillery barracks, and the Palace of Dolma Bagtche, a little farther on—suburb after suburb, bright with the summer residences of Ambassadors and Pashas, and faced again on the Asiatic side by answering villages and kiosques.

Nor is the scene less animated on water than on land. Great iron-clads, flying Turkish colours, yet with a look about them that tells of shipyards on the Thames; stately passenger steamers of Lloyds and the P. and O.; bluft corn-ships from Odessa or the Danube lie side by side with graceful Greek feluccas, Italian brigs, and Turkish coasting craft; while, like dragon-flies, along the waters flit here and there the caïque of the Moslem water-man and the private barge of the rich effendi.

It is a truism to say that nowhere else in Europe can we encounter such a variety of costumes and figures as in Constantinople. Turks, Armenians, Jews, Greeks, Franks, and natives of the East, jostle each other in the streets. What Lady Mary Wortley Montagu

wrote a century ago is true at present. "I live in a place," she observes, "that very well represents the Tower of Babel. In Pera they speak Turkish, Greek, Hebrew, Armenian, Arabic, Persian, Russian, Slavonian, Wallachian, German, Dutch, Italian, French, Hungarian, English; and, what is worse, there are ten of these languages spoken in my own family! My grooms are Arabs; my footmen French, English, and Germans; my nurse an Armenian; my housemaids Russians; half a dozen other servants Greeks, my steward an Italian; my janissaries Turks."

Our pictures represent a few of the more familiar types of the street life. The useful personage, whose back, bent crescent shape from constant loads, will carry up the steepest lane in Galata, with the aid of straps over brow and breast, a burden for which in England we should send a horse and cart, is an old member of the confraternity of Hammals, or Porters—Armenian probably by descent, water-drinker and vegetarian



THE HAMMAL OR PORTER.



THE CAKE SELLER.

almost beyond doubt. The street-seller of those hard, flat ginger-bread cakes, which seem to possess a mysterious attraction for the sweet-toothed Oriental; the barber, so dexterously removing, with the most primitive of razors, the superfluous hairs from the brow and skull of the true believer; the Turkish lady, whose yashmak is no longer a disguise, but the thinnest of veils, adding, in fact, an additional charm to faces whose regular features and dark eyes are often coupled with an unhealthy pallor, will, meet us again and again on our way to the bazaars.

Constantinople has two glories: the glory of the mountains, and the glory of the sea. In every landscape the background is formed by the bold heights of Scutari and the more distant Mysian Olympus, with its snowy summit cutting the clear air like mother-of-pearl. In the city itself there is scarcely a yard of level ground. Old Stamboul is built on a long ridge rising some two hundred feet above the waters that lave it on either hand, a ridge whose top, indented by hollows

and crowned by massive mosques and graceful white minarets, with here and there a pile of ancient ruin, offers a sky-line always changing as the beholder moves, but always beautiful. Then no city has such a sea—a sea deep to its very margin, intensely clear, intensely blue, penetrating everywhere, till you can hardly recognise its arms; a sea that narrows to a river in the Golden Horn and Bosphorus, and spreads into a shoreless expanse in the broad Propontis, studded with shining isles. The central spot of every view is the spot where these three waters meet: Seraglio Point, where the first Greek colonists built their Byzantium, where afterwards stood the palace of the Eastern Cæsars, and where now stands the ruin of the fortress palace of the Ottoman sultans; a wilder-

ness of broken walls and towers, with cypress groves between, and the dome of St. Sophia rising behind. There is no spot on earth that has seen so much history and so much crime as this, where dynasties of tyrants have reigned for sixteen weary centuries.



A DERVISH.

tears down the dust-covered panes, and listened to their monotonous "drip, drip," while a pale sickly reflection from the evening sky lighted up the silent company round the walls.

While it cast a supernatural splendour upon the head of Christ, it seemed, on the other hand, to invest the eyes of the Pharisee with a diabolical expression. Quickly I placed the picture against the wall and quitted the room with a "good-night" to its inhabitants as hastily as though I feared that my loudly-expressed wish might be returned in the same manner. With regained composure, and the practical determination to seek a comfortable resting place, I began to promenade through the rooms, evading, however, the one containing Brengel's "Hell," "The Murder of the Innocents," and other similar ones. I am sure many of you have noticed that in a dim uncertain light, strange life seems to stir in paintings. Even some with which we are familiar in our own homes, assume something peculiar, and often fearful, in the pale twilight of evening or morning; how much more so a whole collection of pictures in a wide and otherwise empty space! Putting aside such sad representations as death-beds, scenes from the lives of tortured martyrs, and others of the same class, simple and homely subjects even look often ghastly enough under the influence of struggling light and shade. Raised arms seem to drop, lifted hands to fall powerless, an advanced foot appears to move forth from its frame, calm features look rigid, agitated ones distorted. Full of such unpleasant thoughts, I wandered on to the outer or Old German room, without remembering that here I should step "out of the frying-pan into the fire." The first glance showed me that the soft and touching figures painted by Durer, Kronach, and others appeared like a veritable company of ghosts, over whom Adam and Eve seemed to preside.

Retracing my steps speedily, I sought protection with Holbein's "Madonna," but even she did not inspire me with the usual

admiration. There was a painful reality about the suffering Child in her arms, and the forms at her feet raised their stiff arms threateningly to keep me off. I could not remain here, so I turned back to my Italians, to the cheerful Albano, the sweet Carlo Dolce, to Raphael's "La Belle Jardinière," and the "Banquet" of Veronese. From Correggio's "Holy Night" a stream of light passed into my agitated heart, and I wondered why I had not stayed near it from the first.

But a few steps brought me into the snug little cabinet memorable to all who have visited the Dresden Gallery. Here I felt quiet and at rest as I stood before Raphael's "Madonna." I placed my trembling hands on the railing enclosing it, and forgot all else for the time, as I gazed on her calm, heavenly face.

Those who have seen the "Madonna di Sisto" may remember the red sofa which stands opposite to this painting. Many have been seated there lost in contemplation of its grand beauty. Many may have dreamt there with eyes open, but I trust none have been overcome by sleep in reality. I stood stroking the velvet bolsters on the couch, as though in apology for seeking rest there, and, if possible, sleep, in place of enthusiastic and ardent admiration.

According to my reckoning, for I did not carry a watch, it was then about nine o'clock. The light from the windows had grown so faint that I could barely distinguish the outlines of the figures on the canvas. When these had also disappeared, I could think of nothing better than to lay my head on the soft cushions and endeavour to sleep. This resolution was more easily formed than carried out. Unpleasant thoughts and feelings increased, and my heart beat wildly.

I applied the remedies of childhood, such as counting, repeating poetry, etc., to calm my agitated nerves. In vain! I was too painfully conscious of my situation to forget it for an instant, and if minutes appeared like hours already, to what fearful length would the dark, dreary night stretch itself? Who has not experienced how acute the

sense of hearing grows during the still watches of the night, especially when we are labouring under violent inward disquietude? I fancied, sometimes, that I heard a distant rustling, then again something creeping nearer and nearer from the farther rooms, then a breathing or whispering.

I began to believe the most incredible might prove credible, the most impossible possible, and I know that at one time I sat erect staring with wide-open eyes at the opposite door, expecting to see nothing less than Herodias entering with the head of St. John the Baptist on a charger.

From that moment I took the utmost pains to quiet my excited imagination. I thought of the daily cares of life, and called the past and future to my assistance; then I told myself how safe and comfortable I was compared to many thousands, resting there on downy cushions, protected from inclement weather, secure from burglars and murderers. But again my thoughts wandered helplessly from my cosy corner to the adjoining chambers, and pictured to themselves dread scenes between gods and goddesses, saints and martyrs, until my brain whirled tumultuously. I felt feverish and full of pity for myself, when I thought of my distant home and family. I had no anxiety on my landlady's account, for I had on several occasions stayed overnight with my friends when the weather was unfavourable, therefore I knew she would not expect me. I was really getting calmer when something occurred which threw me out of my hard-gained composure.

I started up from my seat, then lost my consciousness for an instant, in spite of my good resolutions. What was that fearful crash! Like thunder it rolled on and on through the lower and upper rooms, and now all was as still as before. Slowly my senses returned, but my blood, which seemed frozen a moment before, now throbbled fiercely in all my veins.

My face pressed into the cushion, I listened with breathless suspense, and—yes, something stirred in the house; there was a creeping, shuffling movement on the stairs

and along the corridors. Strange sounds I heard, and awful was the echo they awakened. From all corners of the vast building, steps seemed approaching nearer and nearer, doors creaked on their hinges, and I heard distinctly the rattling of large keys. "Tap, tap, tap!" it came on through the first room, through the second, nearer and nearer to my hiding-place.

I sat motionless, unable to move a finger. I was only conscious that I should see something go through some awful scene—but what? I dared not think of that. I closed my eyes to shut out the sight of the dread thing that came towards me with such fearful certainty.

I remained but a few seconds in this agonising suspense, though at that time it seemed to me—oh, how long! A faint streak of light fell upon my closed eyelids, and caused them to open mechanically. Like one in a dream, I gazed on the apparition standing in the doorway in strong relief from the darkness beyond. It was a figure cast in Rembrandt's light and shade, stepped forth, as it were, from an antique frame, and the lantern which the old man held up high towards me threw a red, glowing reflection on a wrinkled brow, fringed by long silvery hair, and on a pair of dark piercing eyes, which were riveted on mine, as mine were on them.

"It is you after all!" exclaimed the old man, after this silent mutual greeting. "After all! I thought so. If any one had been shut in, it must be you. How glad—ah, how glad I am that I have come; poor lady!"

"But how did you know, how could you guess?" I asked, with a voice trembling in spite of myself, after my late agitation, and when I rose my knees shook violently.

Instead of replying, my deliverer, who was no other than my kind old friend who had warned me, merely shook his head. "By-and-by," he said, as he hurried me through the dismal apartments. I need not tell you that this time I left the gallery without regret. When I saw how carefully, though hastily, my guide fastened each door

with bolts and bars, I realized fully how securely I had been imprisoned. I scarcely ventured to look back, and shuddered to think of the agonising fear I had undergone, when I had first heard the creaking and slamming of the doors re-echo through the lofty chambers. I was not far enough from the scene of my sufferings to be able to laugh at them, and involuntarily kept close to the side of my conductor.

The old man did not speak a word, and only stopped when we reached the cloak-room, where I took my hat from the peg, and wrapped myself up in my shawl, for I felt cold and shivery. In the lower corridor I found my goloshes in their accustomed corner, and here my friend broke the silence by saying, as he pointed to them, "Your thanks are due to them, lady—next to the Madonna," he added, crossing himself devoutly.

"And to you," I replied, trying to take his hand, which he withdrew, however, hastily, as if feeling ashamed.

I will not try to describe the delight with which I imbibed the night air, damp and chill though it was, when the last door of my huge black prison was closed behind me. The old man accompanied me to my lodgings, telling me on the way the cause of his unexpected appearance.

He had been on duty below that day, and after his colleague had assured him that all was in order in the upper rooms, he had commenced locking up for the night. He went on to say, that often a trifling thing, which we scarcely notice in passing, recurs to our mind with great distinctness after some time, and so it happened that while eating his evening soup he had recollected seeing a pair of goloshes in the passage below before closing the outer door. This had certainly occurred before, and he told himself as much; but the more he reflected the more he became convinced that no lady—and a lady's goloshes they certainly were—would leave the building without them on such a miserably wet day. Arrived at this conclusion, he had imparted his anxiety to his wife; but she, good old soul,

like the best of women, had thought too much of him and too little of the rest of the world, and had besought him not to venture near the haunted place at that time of night. "What else could I do," continued the old man, "but wait patiently until the hour arrived in which I am accustomed to smoke my nightly pipe in company with my colleagues at a quiet house close at hand—where I have done that to-night, you know, lady?"

He smiled, but I could find no words to express my gratitude, feeling ill and exhausted; but I am sure he understood me, for he took my hand and shook it heartily as we reached my door, saying that he hoped I should sleep as well as he intended to do. "And now," he added, "my hour for smoking is past, and I must hurry home; my good wife must not know where I have been, else she would not rest all night."

"Why so?" I asked.

"Oh, never mind," he replied; "it's but old women's talk—don't you believe what people may tell you; at the same time, you had better attend to the signal, and not get locked in again."

With these words he rang my bell, which sounded loud and shrill through the silent house, and when soon after my landlady appeared in person to let me in, he left me with a hearty "Good-night!"

My hostess was greatly surprised to see me.

"Dear me, miss, what weather to come home in, and how wet you are!" she exclaimed. She had not expected me, and was just preparing to go to bed. On her asking me whether I had spent the evening with my friends I simply nodded, for I was too weary to tell her of what I had gone through, therefore, leaving her to go to rest, I sought my own room.

The next day being Saturday, on which we were not permitted to paint in the gallery, I found plenty of time to recover from my excitement. My landlady noticed my unusually pale looks, and not being able to evade her sympathetic questions, I im-

parted to her my adventure of the previous day. During the first part of my narrative she interrupted me frequently with expressions of horror and surprise, but as I went on she grew silent and looked at me, her face deadly pale. It was some time before she recovered herself, and when she did, told me something that I was glad not to have known twenty-four hours previously.

The first part of her story was not new to me; I had heard from my friends in what danger the richest treasure of Dresden, the picture gallery, had been in the days of the revolution, and that its preservation was mainly owing to the courage of an architect. In the streets the combat raged fiercely, the air reverberated with the approaching tramp of rebellious multitudes: a human sea which flooded all obstacles and threatened destruction to everything in its blind fury. All order had vanished, nothing sacred was spared, and every hour the danger which threatened the gallery grew more imminent. Night fell, but it brought no rest!

Here and there a cannon-ball had already pierced the walls and shattered the window-panes. Pale and anxious, the few men on guard who had not fled walked to and fro in the darkening rooms, lighted up ever and anon by a sudden gleam of fire raging without. Forlorn hope was to be read in their agitated features, when all at once the man to whom we owe the preservation of so irreparable a treasure rushed into the building. His presence of mind and example worked wonders. What had appeared impossible was carried out. Next morning's rising sun looked down on the most fearful devastation, on the broken windows and blackened walls of the gallery, but its precious contents were well packed and unharmed in safe places.

My hostess did not dwell long on the merits of this courageous act, but took pains to describe the horrors of that night in all its details. This is not the place to give further particulars of the political events during those days; it is sufficient to add that after a temporary banishment in wooden cases, the works of

art adorned the old walls again in their usual splendour.

It was in the month of May, in the year following the revolution. The sentinel in front of the gallery was walking leisurely up and down, whistling softly to himself, when the clock of the nearest steeple chimed the midnight hour. Dead silence reigned in the streets, myriads of stars glittered in the deep blue sky.

"Strange!" he muttered, as he stood still, gazing intently upwards. Behind the well-secured windows he saw flashes of a blue light, coming and going fitfully, and casting their rays on the path below.

"Strange!" he repeated, and his first thought being naturally of thieves, he hurried to the principal entrance, which he found, however, fastened as usual. Peeping through the keyhole into the interior, he could see nothing; the corridors were wrapt in utter darkness, but on placing his ear to a crevice he heard distinctly a loud noise proceeding from the upper rooms. Was it the packers busy at work?

The sentinel knew his instructions. With a loud cry, "Thieves! thieves!" he knocked at the door of the nearest official. In the course of a few moments the latter made his appearance with a dark lantern and the necessary keys, but on looking at the light at the windows, and listening to the noise from within, he declared that he could not act on his own responsibility, and ran off to rouse his superior from his first sweet slumber.

"What can you want?" asked that worthy. "How are thieves to get into the place?"

"And suppose—they were not—thieves, sir?"

"Well, surely you don't believe they are ghosts? You coward! I'll come, were it only to drive a cat from the premises.

"Bah! it's the reflection of the glittering stars," he exclaimed, disdainfully, on seeing the light in the windows. Without hesitating further he pushed the huge key noisily into the lock, and took the lantern to light the way, his trembling subordinate following

on tiptoe. Yes! he heard the same noise as the others did, but his face expressed neither fear nor hesitation, simply curiosity. Suddenly he halted half-way up the stairs, listening intently, and his companions saw that he became pale and grave.

Plainly they heard what seemed the moving of heavy pictures and cases, and hollow strokes with many hammers. The nearer they approached the inner doors the more distinctly the sound of many voices whispering hurriedly and anxiously reached their ears.

"Forward!" cried the inspector, recovering himself, and opening one door after another in quick succession.

"Villains!" he roared with an angry voice, holding the lantern above his head.

Dead silence and utter darkness surrounded him. Motionless hung the pictures around the walls, and hundreds of eyes looked down from them, as it were, with silent reproof at the nightly intruders.

As it was in the first room, so it seemed in all the rest; everything in its wonted order. If anything ghost-like was to be seen, it was the white face of the scared subordinate; even the inspector could not help shaking his head at what he termed "a strange delusion."

After another fruitless search of all the chambers, they turned to go, but scarcely was the first door closed behind them, when the man laid his finger on his quivering lip, turning his ashy countenance towards his superior. The same knocking and hammering, the same hurried whispering as before, was heard with alarming distinctness. The inspector stamping his foot, and without another word or look, retraced his steps,

undaunted and alone. After a quarter of an hour had elapsed, during which the man awaiting his return had heard the weird noise without intermission, he appeared.

"It is nothing!" he said, with a firm, hard voice, his face of a leaden hue. "Let us go home."

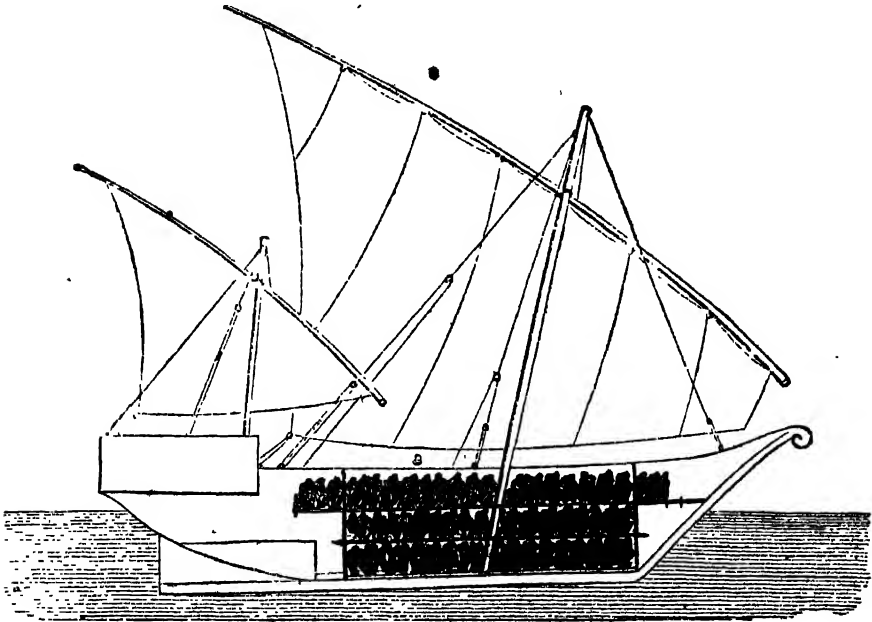
"Not a word did he ever utter on the subject," continued my hostess; "the knowledge of what he saw he has taken with him into the grave, to which they carried him soon after. So much is certain, however, that no one has since ventured at night-time into the gallery, and that the same noise proceeds from the rooms yearly on that day.

"And that day," she concluded, looking hard at me—"that day was—yesterday!"

I could not help shuddering at this unexpected communication, and although I tried to think that the old inspector had seen nothing, consequently had nothing to relate, yet I felt grateful to my goloshes for having spared me a personal experience in the matter. My enthusiasm was too genuine to suffer from this event. I visited the gallery as before, it grew more and more home, but for the nights I gave preference to the humble roof and hearth of my kind landlady, in whose estimation I had risen visibly since my narrow escape from contact with the spiritual world.

I painted and studied with eagerness and perseverance, and used every hour granted to the students in the gallery, but "the busy bee," as some ironically called me, never missed the signal again—never forgot herself again in one or the other sweet intoxicating flowers of art.—*Abridged from the "Leisure Hour."*





SECTION OF DHOW, SHOWING MODE OF STOWING SLAVES.

SLAVE-CATCHING IN THE INDIAN OCEAN.

MORE than half a century ago, the great powers of Europe united in a solemn condemnation and proscription of the slave-trade; and England, with some other nations, has since endeavoured to give effect to this verdict of the civilized world. But the slave-trade has not been extinguished, though in some quarters where it once flourished it now languishes. It annually consumes, it is calculated, the lives of half a million of wretched Africans. According to Consul Churchill, the number of slaves who passed through Zanzibar during the five years ending September, 1867, would not be less than 115,000—and this at one port alone! Nor do these figures represent the full extent of

the horrible traffic. Besides those actually captured, thousands are killed or die of their wounds and famine, driven from the villages by the slave-trade; thousands in internecine war, waged for slaves, with their own clansmen and neighbours, slain by the lust for gain, which is stimulated by the slave purchasers. The many skeletons seen amongst rocks and woods, by the little pools, and along the paths of the wilderness, attest the awful sacrifice of human life, which must be attributed, directly or indirectly, to this trade of hell. The reports of the commanders of Her Majesty's cruisers amply justify all that has ever been stated of the horrors of the traffic in human beings. Writing on September 12, 1875, Captain Ward, of the *Thetis*, says,—“On the 9th inst. we were standing leisurely across to Madagascar, under sail, having put our fires out, when a sail was reported from the masthead standing the same way as our-



DESTRUCTION OF A SLAVE DHOW ON THE EAST COAST OF AFRICA.

selves. We did not come up with her until about 5.30, when the first lieutenant boarded her in one of the cutters, and immediately after we had the satisfaction of seeing him take her in tow to bring her to the ship. There was no necessity to ask for papers, for a momentary inspection was sufficient to satisfy the boarding officer that the dhow was a full slaver; so we at once set to work to bring the human cargo on board.

"It was a long business, and by no means an agreeable one—upwards of 300 souls being taken from the hold. Out of this number about sixty were Arabs and crew, and the remainder slaves. She had only been three days out, and therefore it may be supposed that the cargo was in comparatively good condition. Still, many of them were in a very emaciated state, and three have died since we received them on board. One poor old woman, whom I found lying on her back in the hold, was at first thought to be dead, but on her being lifted up she commenced screaming violently, and struggling with the men who were carrying her out of this pest-house. She is now quite well, and in her right mind.

The slaves were stowed on two temporary decks, each about three feet high, the upper one being roofed over with cocoa-nut leaves. Of course the poor creatures could not move from the place where they squatted, and the stench in the lower tier was of such a nature as to make one wonder how any human being could live there for an hour, and it would probably have been a full week before they were released, had they not fallen in with the *Thetis*. After clearing her out and taking as much of her provisions as we thought necessary, we set her on fire in several places and put twelve pounds of powder in the lower part of her hold. In a few minutes we had the satisfaction of seeing this explode, shortly after which this vile craft went to the bottom, never again to carry a living freight."

The following harrowing details of the capture of an Arab slave-dhow are related by an officer of H.M.S. *Vulture*:—"We

were steaming into Majunga, a port on the east coast of Madagascar, when a large dhow was made out inshore of the ship. When the *Vulture* was near enough, a boat, in charge of a young officer, was sent on board the Arab, whose true character and the nature of his cargo were soon made known. On going below, the men found a framework of bamboo constructed on each side of the hold, ranging fore and aft, in which two hundred and thirty-eight human beings were packed, tier upon tier, like bottles in a rack. The occupants of each tier were placed in the closest personal contact with each other,—so much so, in fact, that, to use the men's homely phrase, they really 'were stowed away like herrings in a cask.' When taken out and placed upon the deck, their limbs were useless; they were seized with vertigo, and fell from sheer inability to stand. Some were found in a truly shocking condition. One or two young children were discovered crushed to death. The lower tier had been laid upon the sand ballast, and was half buried. One poor woman really was buried, with the exception of her face; her mouth was full of sand, and when taken out she was on the point of suffocation. The mortality among a batch of negroes must be sometimes frightful, not only on board the dhows, but also during the journey down from the interior. There was a woman among this lot, who, if her statement is to be credited, was the only survivor of a numerous band. Six months since she roamed as free as air in her native village in the middle of Africa. The Arabs went with fire and sword; the village was burnt, and the greater number of the women and children were made prisoners. Then commenced a weary march of four months' duration. Fresh accessions of slaves were made as they passed along on their way to the coast. Manacled women fell by the wayside, and being unable to travel, were left to die in the jungle. Young children withered like plucked leaves, and the Arabs, to these more merciful, struck off their heads and threw them aside. The woman has survived them all,

but she is alone. Of all the band captured with her, she states that she is the only one left alive to tell the sickening tale."

Lieutenant Henn also describes the capture of a dhow, and the mode of stowing of the poor creatures. "The dhow, on seeing us, lowered her sail, and a few minutes afterwards she was brought alongside with one hundred and fifty-six slaves in her: forty-eight men, fifty-three women, and fifty-five children. The deplorable condition of these wretched negroes, crammed into a small dhow, surpasses all description. In the bottom of the dhow was a pile of stones as ballast, and on these stones, without even a mat, twenty-three women were huddled together, one or two with infants in their arms. These women were literally doubled up, there being no room to sit erect. On

a bamboo deck, about three feet above them, were forty-eight men crowded together in the same way; and on the upper bamboo deck there were fifty-three children. Some of the slaves were in the last stages of dysentery and starvation. On getting the vessel alongside and clearing her out, a woman came up, having an infant about a month old in her arms, with one side of its forehead smashed in. On asking how it was done, she told us that just before our boat came alongside the dhow, the child began to cry, and one of the Arabs, fearing the English would hear it, took up a stone and smashed it. A few hours after this the poor thing died, and the woman was too weak and ill to point out the monster who had done it from amongst the ten or dozen Arabs on board."



KRUPP AND HIS FOUNDRY.

THE Germans are justly proud of Alfred Krupp, the owner and creator of probably the largest, and certainly the most famous foundry in the world. Nor is their boast a false one, that Krupp's guns are well-known in every quarter of the globe, and are appreciated and sought for with just as much zeal by the Chinese and Japanese as by the Russians and Turks, and even the very name of Krupp's business place, Essen, is far-famed because of this one man's exertions.

Alfred Krupp was born on April 11th, in the year 1811, at Essen, in Prussia, where his father, Frederick Krupp, had a small steel foundry. In 1826 the elder Krupp died without leaving any considerable fortune to his widow, who, with the assistance of her son, carried on the business until 1848, when she retired in favour of her assistant.

Herr Krupp continued to make great progress with his foundry, but without attaining any international reputation until the Great Exhibition of 1851, when he attracted attention by sending to London a single block of steel weighing 1,500 kilogrammes. An English firm, however, produced a still heavier block, and was considered to have defeated its German opponent, when, to the astonishment of the mercantile world, a second block, weighing 2,500 kilogrammes, was sent over from Essen, and Herr Krupp remained the victor. This peaceable contest created no little stir, and by it the German founder's reputation, if not fortune, was made. The verdict of the Exhibition adjudicators was, that "F. Krupp's foundry in Essen had produced the best cast steel in the whole Exhibition," and that this manufactory had been "the first to make cast steel in such large and uniform pieces," etc. Again, in the 1862 Exhibition, Krupp was a most successful exhibitor, showing, among other samples of

his skill, a cast steel block of 100 cwt., which, being broken into halves by a steam hammer of 1,000 cwt., was found to be perfectly pure and free from flaws.

The many other marvels of his skill, especially in portions of machinery for railway locomotives and steamships, space will not permit allusion to. One speciality of Krupp's exhibit in 1851 must not, however, be passed by without mention, and that is his cast steel guns. The attention of the French Government was particularly attracted to this artillery, and the experiments it made with it afforded convincing proofs of the practical value of the Essen manufactory. These guns at that time were of very small calibre, but Krupp was continually experimenting with them, until he finally succeeded in producing those gigantic pieces of artillery which are now world famous. Indeed, it is asserted that upwards of 15,000 cast steel guns have, up to the present time, been made by the Essen establishment, and disposed of in various quarters of the globe. In the Philadelphia Exhibition of 1876 Krupp exhibited many wonders that startled even the Americans, accustomed as they are to all kinds of mechanical marvels. It is impossible here to attempt any description of the various apparatus which was sent from the Essen foundry, and which not only included field and mountain artillery, axles, wheels, etc., for locomotives and railway carriages, but even steel plates, springs, and such smaller articles.

Turning towards the establishment where all these marvels are manufactured, fresh causes for astonishment are discovered, Krupp's busy little town rivalling even Saltaire in area and activity. Altogether, the establishment covers a superficial area of 1,000 acres; about 190 of which are covered with buildings. Whichever way the sight is directed on Essen, the eye encounters smoke-grimed chimneys, extensive walls within which busy smiths are hard at work, and foundries in which the liquid metal glows and bubbles, whilst all around is heard the noise of hammers wielded by

thousands of workmen. In the year 1877, the Krupp foundry possessed 1,648 various kinds of furnaces, 298 steam boilers, 77 steam hammers, 294 steam engines, ranging from two to one-thousand horse-power, or altogether 11,000 horse-power; and 1,063 other kinds of machines. These figures will afford some idea of the amount of skill and supervision required to maintain everything in order, and one is scarcely surprised to learn that last year 8,500 workmen were employed in the cast steel factories alone, whilst between 4,000 and 5,000 workpeople were engaged upon other duties connected with the establishment. By means of this army of men Krupp is enabled to turn out a monthly supply of 250 field pieces, thirty small and twenty-four large cannons, besides an enormous quantity of articles for peaceful purposes.

To keep all these foundries employed, Krupp possesses several mines in various parts of Germany, and even at Bilbao, in Spain, whence the metal is brought by a regular line of steamers to the mouth of the Rhine, and thence conveyed by rail to the furnace. Altogether the number of people employed by Krupp in the performance of these various labours is little short of 15,000, who all work together under their employer's skilful direction with the regularity of a machine. The daily consumption of coal by this large army of workers is about 2,200 tons.

The creature comforts and requirements of his people are carefully provided for by Herr Krupp. He has had 3,277 dwellings erected for his clerks and workmen, in which everything needful has been thought of, whilst all their "from home" wants are supplied by an hotel, eight public-houses (for teetotalers are unknown in Germany), a mineral-water factory, a steam-mill, a bakery, a slaughter-house, and twenty-two establishments for the sale of furniture, meat, shoes, and indeed, every sort of native and foreign produce. 195,000 kilogrammes of bread, of an excellent quality, are produced daily by the bakery, and sold at a low price to the workpeople. Fire and

life insurances, invalid and pension societies, hospital, bathing establishment, four people's schools, besides an industrial school for girls and work-school for women, all proclaim the thoughtfulness of Herr Krupp, their founder and benefactor.

But it is impossible to recount all the

wonders—wonders far surpassing the fabled deeds of the Arabian Aladdin—this truly great man has produced in his little Westphalian birthplace ; it suffices to say, therefore, that he himself resides in a newly-erected and almost magnificent castle on the banks of the Ruhr at Werden.

THE PURSUIT OF KNOWLEDGE.

THOMAS EDWARD.



THOMAS EDWARD, the Scotch naturalist, was the son of a private in the Fifeshire Militia, and was born at Gosport on Christmas Day, 1814. After the Battle of Waterloo had brought the war to a close, the militia regiments were relieved from the duty of guarding our sea-coast towns, and young Edward's parents went home to

Aberdeen, where his father worked as a hand-loom weaver.

Here Thomas was in his glory. The Green, where the Aberdeen Railway Station now stands, was then really a green, and close by were the "Inches," near the mouth of the Dee, over which the tide flowed daily. The boy was always in the open air searching for and appropriating every living thing which he could lay his hands on. He was constantly bringing home "beasties," such as tadpoles, horse-leeches, beetles, frogs, caterpillars, rats, hedgehogs, moles, and birds, which, for want of proper receptacles, escaped and overran the house, and sometimes invaded the dwellings of the neighbours, who complained greatly of the annoyance caused by the "venomous beasts." Tom was scolded and flogged, deprived of his clothes, and tied up to the table, but nothing could keep him at home : once he slipped out with nothing but an old petticoat around him,

and, paddling about in the "Inches," caught a chill, which resulted in a fever and laid him up for some time.

But no sooner had he recovered than he took to his old ways, one of his chief feats being the capture of a wasp's nest, which he carried home wrapped up in his shirt, and which his parents plunged into boiling water to render it harmless to the rest of the family ; on another occasion he caught an adder, which he sold for fourpence to a chemist in the town, whose shop-window contained many specimens of Tommy's collecting. At the age of five he was sent to school, principally to keep him out of harm's way ; but he was a sore plague to the teachers, for when he was not playing truant, he was sure to bring some "beast" with him to the school. From his first school he was dismissed because a jackdaw which he had with him joined in the the prayers with a loud "caw ;" from the second he was expelled because his horse-leeches, getting hungry, had crept out of their bottle, and began to feed upon the legs of his fellow-pupils ; and from the third he was also expelled because he was accused of bringing in a centipede which was found upon a desk, besides getting a severe beating for denying the false charge.

After this he wandered about the "Inches" for a time, and at the age of six years went to work at a tobacco factory, about two miles from Aberdeen, where he first saw the kingfisher and the sedge-

warbler. It was a happy time for the boy, but it was not to last. After two years his parents apprenticed him to a shoemaker, who seems to have been a drunken and

brutal fellow, as well as a hard taskmaster. He had no love for animals, and ruthlessly destroyed the pet sparrows, moles, and other "beasts," which Edward took home.



THOMAS EDWARD.

The indentures were for six years ; but at the end of three Edward ran away, and set off on a wonderful journey of 100 miles to visit his uncle at Kettle, in Fifeshire. He

returned after a week with sixpence in his pocket, which he had saved out of eighteenpence given to him by his uncle, and resumed work with his old master, still

occupying his leisure hours, which were few and far between, with his favourite pursuits.

In 1831 he enlisted in the Aberdeenshire Militia, and on one occasion narrowly escaped punishment for insubordination, having left the ranks while on drill to chase a rare butterfly which had attracted his attention. At the age of twenty he removed to Banff, where he fell in love with a Huntly lass, whom, after three years' courtship, he married; and the couple not only lived happily together, but managed to bring up a family of eleven children on an income of 9s. or 10s. per week. Edward would work from six a.m. to nine p.m. at his shoemaking, and then spend half the night in seeking for new natural history specimens to add to his collections. Somebody once remarked to his wife that it must have been rather hard upon her to have had her husband so much away, besides the torn clothes and the "rubbish" he brought with him when he did come back; but she replied, "Weel, I didna complain of his interest in the beasties. Shoemakers were often drunken, but his beasties kept him frae them. My man's been a sober man, and never negleckit his work. So I let him bide." She was a wise woman. And a wise man was Thomas Edward too, for, with all his night wanderings and his exposure to the cold, he *never touched a drop of whiskey*. "I believe," he said himself, "that if I had indulged in drink, or even taken it at all, I never could have resisted the weather as I did. As to my food, it merely consisted of oatmeal cakes washed down by water from the nearest spring. Now and then, as a luxury, my wife would boil me an egg or two; but I never drank anything but water."

Some of his adventures were really of a thrilling character. He was often bitten while endeavouring to capture rabbits, squirrels, or weasels; on one occasion he was tripped up and stunned during a scuffle with a trio of full-grown badgers; and at another time he was attacked while sleeping by a polecat, which, after two hours' struggle, he only succeeded in over-

coming by the aid of some chloroform, which he luckily had about him. The only weapon which he carried was an old gun, which had cost him 4s. 6d., and which was so rickety that stock and barrel had to be tied together with string; a cow's horn serving him as a powder-flask, and the bowl of a tobacco-pipe as a measure for the powder.

During these night wanderings Edward acquired an immense store of information respecting the habits of all kinds of animals, and after eight years' labour (Sundays excepted, for he was a strict observer of the Sabbath), he succeeded in accumulating 2,000 specimens of creatures found in the neighbourhood of Banff. These, arranged in 300 cases, he exhibited at St. Brandon's Fair, Banff, but the receipts hardly covered his expenses; added to which misfortune a collection of about 2,000 plants which he had made were destroyed by some rats, which got into the box where they were stored. He afterward took this collection to Aberdeen, but there, too, it was a financial failure, and the disappointed enthusiast sold it for £20 10s., and returned to his lapstone and hammer at Banff, and for a short time gave up his collecting in despair. The old passion, however, soon reasserted itself, and Edward turned again to his old pursuits with greater zeal than ever.

About this time he became acquainted with the Rev. James Smith, who lent him some works on natural history, which he devoured with avidity, and having by this time learnt to write as well as read, he began to send descriptive articles to the local papers. He subsequently contributed some papers on Natural History to the *Zoologist* and the *Naturalist*, and becoming better known, carried on a large correspondence with various people who took an interest in such subjects. He is now sixty-three years old, and up to a very short time ago, when by Her Majesty's special desire, a pension of £50 a year was granted to him, he was obliged to earn a living at his old trade. The sketch of his life given by Mr. Smiles, abounds with incident and instructive lessons.



PELICANS AND STORKS.
FROM A PAINTING BY HARRISON WEIR.

A RAILWAY IN THE CLOUDS.



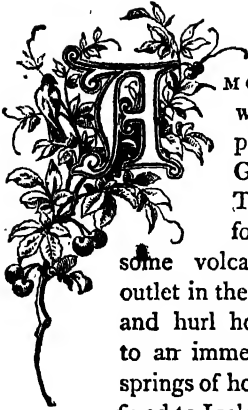
THE following is an account of a ride in one of the railways which thread their way among the peaks of the Colorado mountains in America :

"Between Veta mountain and the Peaks nestle the quaint cluster of houses constituting Veta Station. Recalling the eye from the distant to the immediate, it falls with horrified stare upon the precipice which upon our left plunges headlong down among the scattered rocks and blasted trees to the very bottom of the gorge that but a few moments before appeared the loveliest of little valleys. As we draw closer to the car window with that sense of danger which increases the sublimity of the scene, it seems as if we were hanging over the very verge of the chasm, so narrow the ledge upon which we are passing up, up, ever upward ! Fainter and fainter grows the line of the road beneath us, and upon Veta Mountain, directly opposite, we distinguish a freight train apparently going in the same direction we are, but in fact headed exactly the other way, and upon an incline so steep as to look almost as if in the act of falling over upon itself. Still we climb, and every second the scene grows more terrific in its character. Great streams of loose stones fall away from the line of track, poured out as if by superhuman hand all along down the mountain-sides. Here we breathe freer, thinking that if aught should happen to the train, its mad plunge

over the rocky wall would be stopped by the mighty trees that stand stalwart upon the brink. Another sudden turn, and there is nought but the sheer declivity between us and the track nearly eight hundred feet in the dim distance below. Nearing Inspiration Point, the wildness of the ride, the terror-inspiring abruptness of the precipice, the stone-stayed track-bed, and the hoarse mutterings of the locomotive, tend to an excitement that few can control, and for a moment the fact of being actually above the clouds upon a railroad train is not heeded. Nevertheless it is true, for below us wreath the snowy fleeces like softly-fallen snow, out from which the peaks rise in sublime magnificence, and appear to fairly double their towering height. As if intensely impressed with the utter solemnity and majesty of the scene, the ponderous engine lengthens its sonorous breathings, more slowly strides along its steel-bound way, and passes the dizzy depths with motion so stately as to suggest new thoughts of nature's wondrous influences.

We steadily watch until the last ray is lost in the twilight haze, and the last tint faded into the wondrously clear blue of the night ; then over the mountain-sides ; upon the sharp-cut faces of the peaks, down into the moss-carpeted valleys, into the car windows until the lighted lamps look like dusky sparks of smouldering fire, shines the evening star. Those who have seen the Alps, have enjoyed to the fullest the glorious vistas of Switzerland, and have since crossed the Sangre de Cristo range over Veta Pass by starlight, declare there is nothing in all Europe to equal it."

THE GEYSERS.



AMONGST the most wonderful of natural phenomena are the Geysers of Iceland. These are hot-water fountains, which, from some volcanic cause find an outlet in the surface of the earth, and hurl hot water and steam to an immense height. These springs of hot water are not confined to Iceland; in some parts of

America they are also to be found on an enormous scale. The Iceland Geysers are thus described by an appreciative writer,—

"About ten minutes past five we were roused by the roaring of Stockr, which blew up a great quantity of steam; and when my watch stood at the full quarter, a crash as if the earth had burst, which was instantaneously succeeded by jets of water and spray rising in a perpendicular column to the height of sixty feet.

As the sun happened to be behind a cloud, we had no expectation of witnessing anything more sublime than we had already seen; but Stockr had not been in action above twenty minutes, when the Great Geyser, apparently jealous of her reputation, and indignant at our bestowing so much of our time and applause on her rival, began to thunder tremendously, and emitted such quantities of water and steam, that we could not be satisfied with a distant view, but hastened to the mound with as much curiosity as if it had been the first eruption we had beheld.

However, if she was more interesting in point of magnitude, she gave the less satisfaction in point of duration, having again become tranquil in the course of five minutes; whereas her less gaudy but more steady companion continued to play till within four minutes of six o'clock.

Our attention was so much taken up with these two principal fountains, that we had little time or inclination to watch the minutiae of the numerous inferior shafts and cavities with which the track abounds. The Little Geyser erupted perhaps twelve times in the twenty-four hours; but none of its jets rose higher than eighteen or twenty feet, and generally they were about ten or twelve. The pipe of this spring opens into a beautiful circular basin about twenty feet in diameter, the surface of which exhibits incrustations equally beautiful with those of the Great Geyser. At the depth of a few feet, the pipe, which is scarcely three feet wide, becomes very irregular, yet its depth has been ascertained to be thirty-eight feet. There is a large steam-hole at a short distance to the north-west of the Little Geyser, which roars and becomes quiescent with the operations of that spring. A little farther down the track are numerous apertures, some of which are very large, and being full of clear boiling water, they discover to the spectator the perilous scaffolding on which he stands. When approaching the brink of many of them, he walks over a dome of petrified morass, hardly a foot in thickness, below which is a vast boiling abyss, and even this thin dome is prevented from gaining a due consistence by the humidity and heat to which it is exposed. Near the centre of these holes is situated the Little Stockr, a wonderfully amusing little fountain, which deals its waters in numerous diagonal columns with great regularity every quarter of an hour.

Nor is it in this direction alone that orifices and cavities abound. In a small gully close to the Geyser are a number of holes with boiling water; to the south of which rises a bank of ancient depositions, containing apertures of a much larger size than the rest. One of these is filled with

beautifully clear water, and discovers to a great depth various groups of incrustations which are very tempting to the eye of the beholder. The depth of this reservoir is not less than fifty feet. On the brow of the hill, at the height of nearly two hundred feet above the level of the Great Geyser, are several holes of boiling clay; some of which produce sulphur and the efflorescence of alum; and at the base of the hill on the opposite side are not less than twenty springs, which prove that its foundations are entirely perforated with veins and cavities of hot water.

On my return this way from the north, I again pitched my tent for two days beside these celebrated fountains, and found their operations still more magnificent and interesting than they were before. The Great Geyser continued to erupt every six hours in a most imposing manner. In some of the eruptions the jets seemed to be thrown much higher than they were in the preceding year, several of them reaching an elevation of not less than a hundred and fifty feet.

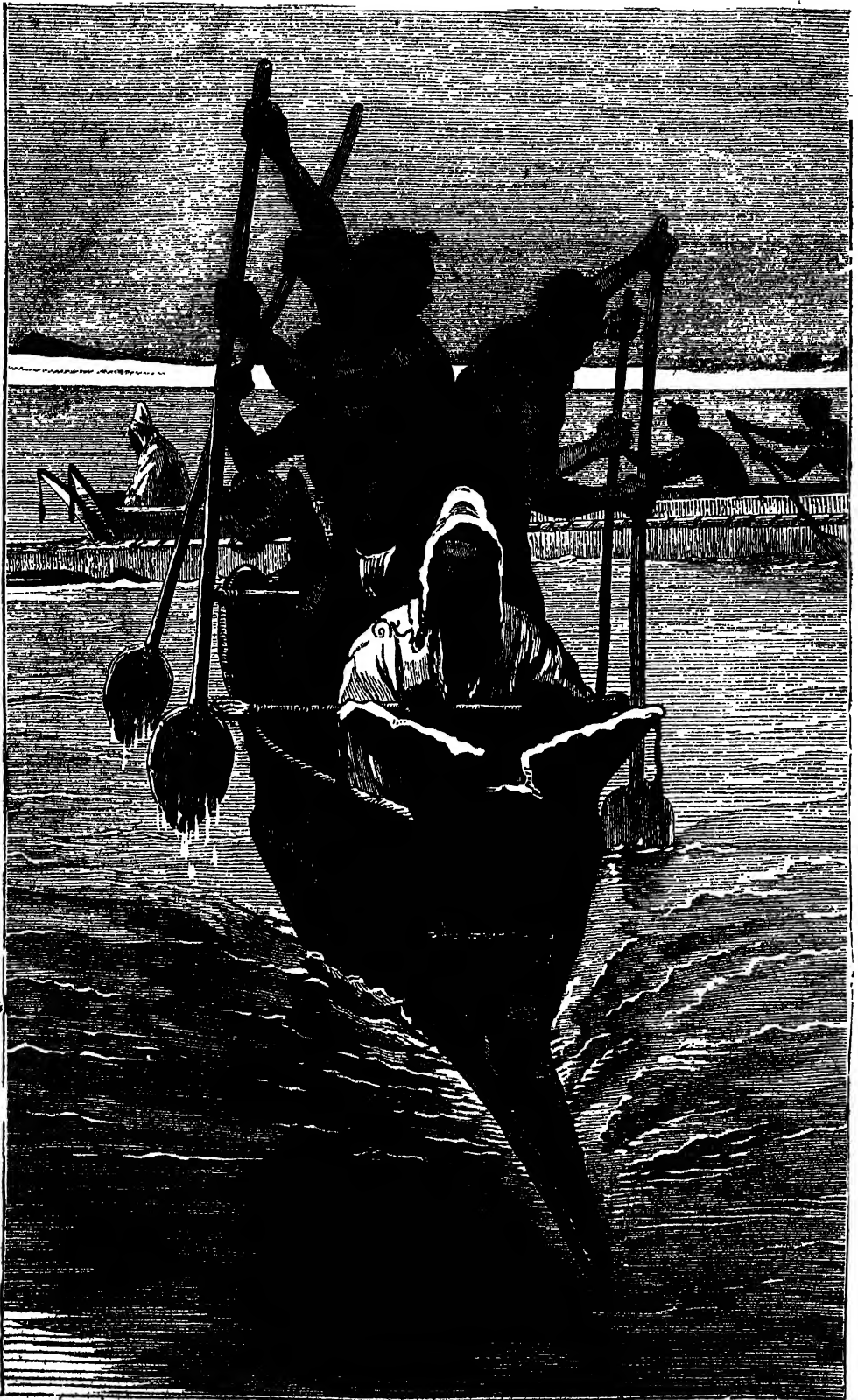
What rendered my second visit to the Geysers peculiarly interesting, was my discovery of the key to Stockr, by the application of which I could make that beautiful spring play when I had a mind, and throw its water to nearly double the height observable in its natural eruptions. The morning after my arrival I was awakened by its explosion about twenty minutes past four o'clock; and hastening to the crater, stood nearly half an hour contemplating its jet, and the steady and uninterrupted emission of the column of spray which followed, and which was projected at least a hundred feet into the air. After this, it gradually sank into the pipe, as it had done the year before, and I did not expect to see another eruption till the

following morning. However, about five o'clock in the afternoon, after a great quantity of the largest stones that could be found about the place had been put into the spring, I observed it begin to roar with more violence than usual; and approaching the brink of the crater, I had scarcely time to look down to the surface of the water, which was greatly agitated, when the eruption commenced, and the boiling water rushed up in a moment, within an inch or two of my face, and continued its course with inconceivable velocity into the atmosphere. Having made a speedy retreat, I now took my station on the windward side, and was astonished to observe the elevation of the jets, some of them rising higher than two hundred feet; many of the fragments of stone were thrown much higher, and some of considerable size were raised to an invisible height.

For some time, every succeeding jet seemed to surpass the preceding, till the quantity of water in the subterraneous caverns being spent, they gave place to the column of steam, which continued to rush up with a deafening roar for nearly an hour.

The periodical evacuation of Stockr having been deranged by the violent experiment, no symptoms whatever of a fresh eruption appeared the following morning. As I wished, however, to see it play once more before I bade an everlasting farewell to these wonders of nature, and especially being anxious to ascertain the reality of my discovery, I got my servant to assist me, about eight o'clock, in casting all the loose stones we could find into the spring. We had not ceased five minutes when the wished-for phenomena recommenced, and the jets were carried to a height little inferior to what they had gained on the preceding evening."





THE PIROGUE.



N their slave-buying journeys the Arab dealers sometimes require to cross the lakes and rivers which are so frequent in Central Africa. For this purpose they generally use a *pirogue*, a native boat most ingeniously contrived out of the trunk of a tree. Sometimes the pirogue

consists of a double boat, being two trunks joined together. This, from its construction, it is almost impossible to upset, and it is consequently much in favour where the passage is dangerous. On smooth waters, however, the pirogue represented in our engraving is generally used; and, propelled by stalwart paddlers, makes rapid progress through the water. In South America, a particular kind of vessel, with two masts and a sail, is also called a pirogue.

THE SUEZ CANAL.



THE Mediterranean is separated from the Red Sea by a strip of sandy desert very little more than 70 miles wide; it is this only which prevents Africa from being an island, and prevents ships from sailing from Europe to India by way of the Red Sea. Hence, from very early times, ingenious men have formed plans for cutting a ship canal across this barrier. The narrowest part is from Tineh on the Mediterranean to Suez on the Red Sea; but as this is a barren region of sand, sandstone, and salt swamps, a route was sought for which would avoid a certain elevated tract of sandstone country. The surveyors found a peculiar depression or level, not much above the sea-level, marked in different places by the Bitter Lakes, Lake Timsah, the Karash salt-marshes, Lake Bellah, Lake Menzaleh, and the plain of Pelusium; this, though a wretched country for a settlement, offered a favourable route for a canal. The Egyptians under Pharaoh-Necho commenced such a work as early as twenty-five centuries ago; indeed, some authorities believe that the canal was

actually finished, and applied to the purposes of trade; that it was from 108 to 165 feet wide, and from 15 to 30 feet deep. But be that as it may, the canal became choked with sand. Traces of it are still visible along the depressed line of route (about 90 miles long) above adverted to. The Greeks and the Romans, the Saracens under the Calif Omar, the Genoese and the Venetians, all in turn contemplated the possible restoration of the old Egyptian canal; indeed, the emperor Trajan really restored it in the second century A.D., and the Calif Omar in the seventh century; but the shifting sands had in every case hitherto conquered the engineers, by gradually choking up that which had been excavated. The celebrated Robert Stephenson, who was engaged with French and Italian engineers in surveying the isthmus at various times between 1847 and 1853, came to a conclusion that a really practical and permanent ship canal cannot be formed in that region; instead of this he constructed a railway for the Pasha of Egypt, from Alexandria on the Mediterranean shore to Suez on the Red Sea shore; and this railway has ever since rendered excellent service. It was left for

M. Lesseps, a Frenchman, to accomplish this marvel of engineering.

Beginning at the northern or Mediterranean end of the canal, there is the new town of Port Saïd, built on a strip of sand which separates the sea from Lake Menzaleh. Although so recently formed, it has a population of several thousand inhabitants, with streets, docks, basins, and quays. The Mediterranean being at this part very shallow, depth for a harbour could only be obtained by constructing two piers or moles, the one a mile and a half and the other a mile and a quarter long, formed of huge blocks of concrete or artificial stone. The enclosed area, 500 acres in extent, has been dredged out to a depth sufficient for large merchant-ships. Basins and docks are connected with this harbour; and then begins the canal itself, just 100 miles long. For four-fifths of the distance, this canal is 327 feet wide at the surface of the water, 72 feet wide at the bottom, and 26 feet deep. The remaining one-fifth is 196 feet wide at the water surface, with the same bottom-width and maximum depth as the other. The great surface-width has been adopted to render the banks very gradual in their slope or shelving, as a precaution against washing away. No less than 96,000,000 cubic yards of stone, sand, and earth have been excavated to form a canal of such large dimensions; and an immense amount of manual labour, aided by dredging machinery of unprecedented magnitude and power, has been needed in the work. The part of the sloping banks a little above and below the water-level is protected by rough stone pitching, to resist the action of waves caused by passing steamers.

From Port Saïd the canal crosses several miles of Lake Menzaleh, a kind of shallow swamp, which requires an embankment to mark and confine the two banks. Then comes the Kantara cutting, three miles through hillocks of sand. This ends at Lake Bellah, a kind of salt marsh, through which the canal runs about nine miles, with side embankments. Next to this comes a portion of plateau eight miles

long, in some parts of which, near El Guisr, the canal had to be dug to the vast depth of 90 feet in hard sandstone—an immense labour, where the width of the canal is so great. Then we come to the central part of the canal, Lake Tensah, where, just about 50 miles from each end, is the new and flourishing town of Ismaïlia, provided with streets, roads, merchants' offices, banks, hotels, cafés, villas, a Roman Catholic chapel for the French inhabitants, a Mohammedan mosque for the Egyptian and Arab population, a theatre, a hospital, a railway station, a telegraph station, an abattoir, a bazaar, and quays and repairing-docks for shipping. This town is one of the most remarkable of M. Lesseps' creations. The canal then passes through nine miles of dry land, where the Scrapeum cutting has called for a vast amount of excavation. To this succeeds a passage of 23 miles through the Bitter Lake, which has for ages been a dry salt depression, but which is now filled with sea-water from the Mediterranean and the Red Sea; the canal itself being marked out by lofty and broad embankments. No less than 10,000,000 cubic yards of water have been admitted to fill up this great depression. A further portion of 17 miles, through dry land and shallow dried-up lakes, carries the canal to Suez, involving extensive blasting at the Chalouf cutting. At the junction with the Red Sea at Suez, all the necessary piers, docks, and quays, have been constructed.

A subsidiary work, without which this great ship canal could not have been constructed, is the Sweet Water Canal. This is about 40 feet wide by 9 feet deep. It brings the fresh water of the Nile, from a point a little below Cairo, to Ismaïlia and Suez, and by means of large iron pipes to Port Saïd. This minor canal is literally invaluable, seeing that it supplied fresh water for the thousands of men employed in the works, and is gradually fertilising what was before a sandy desert. The really grand Suez Canal was opened for traffic in November 1869, and ships of large burden now pass through it.

THE GOLDEN EAGLE.



DISTINGUISHED for majestic size, great power of vision, strength of wing, rapid flight, indomitable courage, and almost resistless powers of attack, the eagle is justly considered the king of birds, and is often introduced as an apposite symbol of human royalty in sacred and secular literature. On the monuments of Nineveh the head and wings frequently occur as the emblems of kingly power; and in the pages of inspired prophecy the noble bird is repeatedly employed to represent Oriental sovereignties for the time overpowering and triumphant. The eagle soars loftily, and builds its platform nest in high places, upon the brow of tall cliffs, or on the uppermost branches of the towering cedar-tree, itself flourishing far up the slope of a mountain chain. The prophet Ezekiel

writes of the king of Babylon as "a great eagle with great wings, long-winged, full of feathers," which "came unto Lebanon, and took the highest branch of the cedar."

The parent birds show tender solicitude for their young, and provide liberally for the wants of the helpless brood. The quantity of food collected for them is so ample that several instances are on record of poor families obtaining sufficient subsistence in straitened times by daily visiting the nests for spoil. As soon as the eaglets are able to cater for themselves, they are roused to exertion by their natural guardians, constrained to quit the nest, incited to ply their wings, instructed by example how use them, and aided in their early attempts, till with confidence and courage they can cleave the air like their parents.

THE ELECTRIC EEL.



ONE of the most remarkable fresh-water fishes of South America is the *Gymnotus electricus*, or electrical eel. Its singular properties enable it to arrest suddenly the pursuit of an enemy or the flight of its prey, to suspend on the instant every movement of its victim, and subdue it by an invisible power. Even the fishermen themselves are suddenly paralysed at the moment of seizing it, while nothing external betrays the mysterious power possessed by this creature.

The French astronomer Richer was the first to make known the singular properties of this American fish. "I was much

astonished," he says, "to see a fish some three or four feet in length, resembling an eel, deprive of all sensation the arm and neighbouring parts which touched it. I was not only an ocular witness of the effect produced by its touch, but I have myself felt it, on touching one of these fishes still living, though wounded by a hook, by means of which some Indians had drawn it from the water. They could not tell what it was called, but they assured me that it struck other fishes with its tail in order to stupefy them and devour them afterwards, which is very probable when we consider the effect of its touch upon a man."

When full-grown the *gymnotus* measures between five and six feet in length; its colour varies with age, and the nature of the

water in which* it dwells. Generally it is of an olive-green, with the under part of the head of a yellow tint mingled with red; and a double row of small excretory openings in the skin, from the head to the tail, are thus coloured; these openings appear to belong to mucous glands, which secrete the slimy fluid with which the skin is lubricated. The mouth is wide, and the interior, as far as the gullet, is furnished with little teeth disposed in rows, and very closely set; the tongue is fleshy, and covered with papillæ. The apparatus which gives to this eel its terrible powers, and renders it capable of discharging an electric shock of such violence as to throw down horse and man, occupies the under parts of the tail, or terminal portion of the body. It consists of four longitudinal



masses; two large above, two small below, each being composed of a vast number of membranous laminæ, or thin plates, closely set together, and nearly horizontal. These plates have their external margins affixed to the skin, and they

rise to a level with the vertebral column; they are, besides, united to each other by an infinite number of transverse small vertical laminæ, and thus are formed a multitude of transverse cells, or minute prismatic canals, filled with jelly-like matter, and abundantly supplied with nerves. "I never remember," says Humboldt, "to have experienced a more terrible blow from the discharge of a Leyden jar of great size, than one which I received on putting my two feet on a gymnotus which was dragged out of the water. During the rest of the day, I felt great pain in the knees, and in almost every joint of the body. A blow on the stomach, a stone falling on the head, a tremendous electric explosion, produce in an instant the same effects: nothing is distinguished, all is vague, when the whole

nervous system is thus shocked violently at the same moment." It is scarcely necessary to say, that in the pools, lakes, or meres, tenanted by this formidable fish it reigns supreme: what, indeed, can withstand its assaults? It comes not upon its foe with teeth, nor the common weapons of its race, for then force might be opposed to force; but it deals destruction by the agency of means against which strength and courage are of little avail.

On the nerves with which these creatures are furnished depend their electric power; but how or in what manner the accumulation of electric fluid takes place, the means which the animal has of discharging it or not, at pleasure, or in what direction it pleases, and the theory of its production—these

points are all enveloped in mystery. We are presented with nerves, and a large laminated apparatus; and we find that these nerves and this apparatus of plates constitute, in some mysterious manner, an electro-galvanic battery, governed as to its use

by volition: but we know no more. How soon are we stopped by impassable barriers in the progress of our investigations among the wonders with which the great field of creation teems! How soon do we discover the limitation of our minds and their inadequacy to grasp a part, a small part, of the ways and workings of the Almighty!

The sketch on the opposite page represents a section of the terminal portion of its body, containing the electrical apparatus, and serves to convey a clear idea of the arrangement of its plates, and the relative magnitude of the upper and lower double series. *a*, the upper and larger pair of electric organs. *b*, the lower pair. *c*, external lateral muscles. *d*, eight dorsal muscles, imbedded in fat and cellular tissue,

and having a concentrically laminated structure. *e*, the spinal column. *f*, the swimming-bladder, which is of an elongated form and of great length, measuring from two to nearly three feet.

The mode of capturing the electrical eel is described by a naturalist, Bonpland, who stopped at Calabozo, on the Orinoco, in order to witness it. "While our hosts were explaining to us this strange mode of fishing, a troop of about thirty half-wild horses and mules had arrived, and the Indians had made a sort of circle, pressing the horses on all sides, and forcing them into the marsh. The Indians, armed with long canes and harpoons, had placed themselves round the basin, some of them mounting the trees, the branches of which hung over the water, and by their cries, and still more by their canes, preventing the horses from landing again. The eels, stunned by the noise, defended themselves by repeated discharges of their batteries. For a long time it seemed as if they would be victorious over the horses. Some of the mules

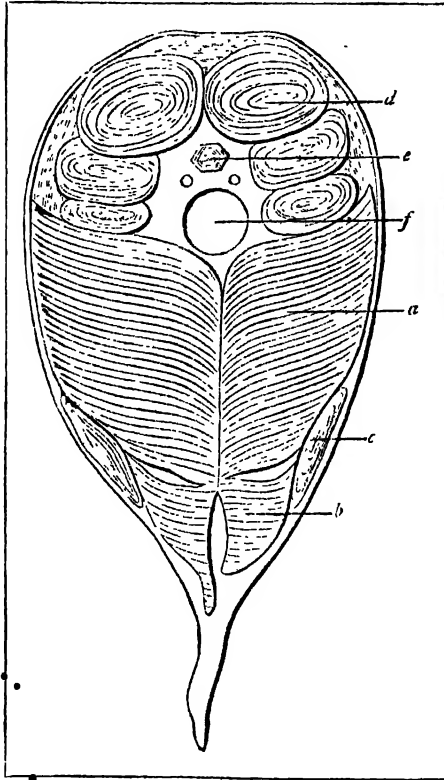
especially, being almost stifled by the frequency and force of the shocks, disappeared under water; and some of the horses, in spite of the watchfulness of the Indians, regained the bank, where, overcome by the shocks they had undergone, they stretched themselves at their whole length. The picture presented was now indescribable. Groups of Indians surrounded the basin, the horses with bristling manes, terror and grief in their eyes, trying to escape from the storm which had surprised them; the eels, yellow and

livid, looking like great aquatic serpents swimming on the surface of the water, and chasing their enemies, were objects at once appalling and picturesque. In less than five minutes two horses were drowned. An eel, more than five feet long, glided under one horse, and discharged its apparatus through its whole extent, attacking at once the heart and viscera, probably benumbing and finally drowning it.

When the struggle had endured a quarter of an hour, the mules and horses appeared less frightened, their manes became more erect, their eyes expressed less terror, the eels shunned in place of attacking them, at the same time approaching the bank, when they were easily taken by throwing little harpoons at them attached to long cords, the harpoon sometimes hooking two at a time, being landed by means of the long cord. They were then drawn ashore without being able to communicate any shock."

Several of these wonderful fish have been brought to England in a living state. A fine *gymnotus* was kept for

many years at the Polytechnic Institution in London. Numbers of experimenters were accustomed daily to test its powers; and the fatal, or at all events the numbing power of the stroke was evident when the creature was supplied with fish. Though blind, it was accustomed to turn its head towards the spot when a fish was dropped into the water, when it would curve itself slightly, stiffen its muscles, and the victim turned over on its back, struck as if dead by the violence of the shock.





THE OLDEST PRISON IN THE WORLD.

ONE of the most interesting relics of Regal Rome is the old Mamertine Prison, constructed by Ancus Martius, and described by Livy and Sallust. Walls built of enormous blocks of stone form a cell, cold and dark and damp. But in the floor is a small opening leading down into a yet more horrible dungeon. Sallust speaks of it as "a place about ten feet deep, surrounded by walls, with a vaulted roof of stone above it. The filth and darkness and stench make it indeed terrible." Here the African king Jugurtha was starved to death, the accomplices of Catiline were strangled, and Sejanus, the son-in-law of Tiberius, was executed. Tradition affirms that yet more illustrious sufferers were confined here. In this state prison it is said that the apostles Peter and Paul were immured. Of this, however, there is no evidence; but the papal legends which so often invest even a probable tradition with incredible marvels, are not wanting here. An indentation in the wall of the staircase is pointed out as having been made by the head of St. Peter when forcibly struck against it by the inhuman gaoler; and a spring of water which rises from the floor is declared to have burst miraculously from the rock for the baptism of his two guards, Processus and Martinianus, though, unfortunately for this tradition, the fountain is described by Ptolemy as existing in the time of Jugurtha's imprisonment. Indeed there is every reason to believe that this chamber was originally a well-house or a subterranean cistern for collecting water at the foot of the Capitol, from which circumstance it derived its name of Tullianum, from *tullius*, the old Etruscan word for *spring*, and not from Servius Tullius, who was erroneously supposed to have

built it. The whole chamber in primitive times was filled with water, and the hole in the roof was used for drawing it out. Notwithstanding its sacred reputation, the water tastes very much like ordinary water, being very cool and fresh, with a slight medicinal taste. A rugged hollow in the wall of the staircase is pointed out as the print of St. Peter's head in the hard stone, said to have been produced as he stumbled and fell against it coming down the stair a chained prisoner. It requires no small amount of devotional credulity to recognise the likeness, or to believe the story.

But there is no need for having recourse to such ecclesiastical legends in order to produce a solemn impression in this chamber. Its classical associations are sufficient of themselves to powerfully affect the imagination. There is no reason to doubt the common belief that this is the identical cell in which the famous Jugurtha was starved to death. The romantic history of this African king is familiar to all readers of Sallust, who gives a masterly account of the Jugurthine war. When finally defeated, after having long defied the Roman army, his person was taken possession of by treachery, and carried in chains to Rome, where he adorned the triumphal procession of his conqueror Marius, and was finally cast into this cell, perishing there of cold and hunger. What a terrible ending to the career of a fierce, free soldier, who had spent his life on horseback in the boundless sultry deserts of Western Africa! The temperature of the place is exceedingly damp and chill. Jugurtha himself, when stripped of his clothes by the greedy executioners, and let down into it from the hole in the roof, exclaimed with grim humour, "By Hercules, how cold your bath is!"

A more hideous and heart-breaking dungeon it is impossible to imagine. Not a ray of light can penetrate the profound

darkness of this living tomb. Sallust spoke of the appearance of it in his day, from the filth, the gloom, and the smell, as simply terrific.

The height of the vault is about sixteen feet, its length thirty feet, and its breadth twenty-two feet. It is cased with huge masses of volcanic stone, arranged in courses, converging towards the roof, not on the principle of the arch, but extending horizontally to the centre, as we see in some of the Etruscan tombs. This peculiar style of construction proves the very high antiquity of the chamber. It is especially interesting, to use the words of Freeman, "as showing that men were at this time making various attempts to bring stones, so as to overlap and support one another; but the perfect arch, with its stones poised in mid-air by a law of mutual mechanical support, had not yet rewarded their efforts."

Besides Jugurtha, several other notable prisoners were confined in this cell. It played the same part in Roman history which the Tower of London has done in our own. Here, by the orders of Cicero, were strangled Lentulus, Cethegus, and one or two more of the accomplices of Catiline in his famous conspiracy. Here was murdered, under circumstances of great baseness, Vercingetorix, the young and gallant chief of the Gauls, whose bravery called forth the highest qualities of Julius Cæsar's military genius, and who, when success abandoned his arms, boldly gave himself up as an offering to appease the anger of the Romans.

"From the Tullianum, or Prison of St. Peter," says Dr. Macmillan, who recently visited the ruins in the Forum, "we were led through a tortuous subterranean passage of Etruscan character, a hundred yards long, cut out of the rock. It was so low that we had to stoop all the way, and in some places almost to creep, and so narrow that a very stout person would have some difficulty in forcing himself through. The floor was here and there wet with the overflowing of neighbouring drains, which exhaled a noisome stench; and we had to pick our steps

carefully through thick greasy mud, which on the slopes was very slippery and disagreeable. We followed each other in Indian file, stooping low, each with a wax taper burning dimly in the damp atmosphere, and presenting a most picturesque appearance. This passage was discovered only a few years ago. Numerous passages of a similar nature are said to penetrate the volcanic rock on which the Capitol stands, in every direction, like the galleries of an ant's nest. Some of these have been exposed, and others walled up. They connected the prison with the Cloaca, (which had its outlet in the river Tiber), and doubtless furnished means by which the bodies of criminals who had been executed might be secretly disposed of. The passage in question brought us to four other chambers, each darker and more dismal than the other, and partially filled with heaps of rubbish and masses of stone that had fallen from their own roofs and sides. At the top of each vault there was a man-hole for letting a prisoner down with cords into it.

A visit to these six vaults of the Mamertine Prison gives one an idea that can never be forgotten of the cruelty and tyranny which underlay all the gorgeous despotism of Rome, alike in the kingly, republican, and imperial periods. Some of the remains may still be seen of the *Scalæ Gemonæ*, the 'steps of sighs,' down which the bodies of those who were executed were thrown, to be exposed to the insults of the populace. The only circumstance that relieves the intolerable gloom of the associations of the prison is, that Nævius is said to have written two of his plays while he was confined in it for his attacks on the aristocracy: a circumstance which links it to the Tower of London, which has also its literary reminiscences.

After having been immured so long in such disagreeable physical darkness,—appropriate emblems of the deeds of horror committed in it,—we were truly glad to catch at last a faint glimmer of daylight shimmering into the uppermost passage, and to emerge into the open sunshine."



CAPTAIN BOYTON'S LIFE DRESS.

A FEW years ago a statement went the round of the papers, to the effect that an American had jumped overboard from the National Liner steamship *Queen*, some miles from the Irish coast, and had succeeded in gaining the shore safe, warm, and dry, a violent storm notwithstanding. Although it was men-

tioned that the adventurer was equipped with a life-saving apparatus, the statement taxed the credulity of most people who know what the sea is in a storm. The fact, however, was well authenticated that Captain Paul Boyton, of the New Jersey Life Saving Service, Atlantic City, did so quit the vessel, and after remaining in the sea for seven hours, and drifting some miles

along the coast, he was at length cast ashore high and dry at Trefaska Bight, on the Skibbereen coast, and the next day made his way to Cork, where he rejoined his anxious friends on board the *Queen*.

Captain Boyton soon became better known to the people of England, and his experiments excited great curiosity. He crossed the Channel, went up the Thames and other rivers, and proved in every way the value of his invention, and his name and achievements are now familiar round the world.

The aquatic feats with which Captain Boyton astonished the good people of England were accomplished by means of a dress which, though known by his name, is really the invention of a Mr. C. S. Merriman, of New York; Captain Boyton, a man of great pluck and resolution, having been commissioned to introduce it into Europe. This life-preserving garment is made of solid india-rubber, and is in two parts, the lower being the pantaloons, to which boots are attached, and the upper the tunic, with sleeves, gloves, and helmet connected to it. The pantaloons are formed with a waistbelt or hoop of steel, which is elastic and has a rib of india-rubber running round the outside. The tunic has a similar rib of rubber around the inside of the waist, which is drawn over and contracts under the rib on the pantalon belt, and by its elasticity, gripping in tightly, forms a water-tight joint. This joint is further secured by an outer belt of rubber fastened with a buckle. Having put on this suit in the order indicated in our description, the operator next proceeds to inflate it, which he does by blowing in turn through five tubes, fitted with stop valves, each tube communicating with an air-chamber. Of these chambers there are two in the pantaloons, two in the tunic, and one in the helmet. In the front of the helmet an aperture is left large enough to show the eyes, nose, and mouth

of the operator, and the act of inflating the helmet brings the edges of the rubber in close contact with the face, so that there are only a few square inches of exposed surface. The suit weighs 15lb., and when fully inflated is stated to be capable of sustaining a weight of 300lb., which allows for the weight of a person saved by the wearer from drowning; besides which, the inventor has provided for the contingency of damage to any one of the air-chambers. The suit when out of use is packed away in an india-rubber bag weighing about 2lb. This bag has a compartment round the mouth in which three gallons of water may be stowed away. In the bottom of the bag are placed provisions, signal lights, etc., and air is blown into the water compartment, which expands the mouth of the bag inwards and so closes the opening, which can further be strapped tight. Equipped in this dress, and thus provisioned and provided with a paddle, the voyager is unsinkable, and, apart from danger from sharks or from concussion with rocks, there is no reason why he should not remain in the water for an indefinite period. As the dress fits loosely and is put on over the ordinary clothing, the temperature of the body is equally maintained. With a little practice, it can be put on and inflated in two minutes. Captain Boyton's first attempt to cross the English Channel, from Dover to Boulogne, was frustrated only by want of knowledge of its conflicting currents, and the refusal of the French pilot to take any responsibility after nightfall. His second attempt was made under more favourable conditions, and crowned with complete success, his voyage having occupied the twenty-four hours all but twenty-two minutes. Since that adventure, the dress has been successfully tried by others, and there can be no question that Captain Boyton has added a most wonderfully efficient means to those already in existence for the saving of life at sea.

THE THAMES TUNNEL.



ENGINEERING science, and the skill displayed in overcoming physical difficulties, have been wonderfully developed during the present century. A striking instance of this is found in the Thames Tunnel, begun by Sir Mark Isambard Brunel in 1825, continued by his son, and completed in 1843. This work, though now applied to a use of which its originator little dreamed, is still the most important subaqueous tunnel in existence, and appears likely to remain so, at least till the railway tunnel between England and France has become an accomplished fact.

More than three-quarters of a century ago, the idea of connecting the shores of the Thames by a subway was proposed. This was by Mr. Ralph Dodd, an engineer well known in his time. The attempt was made, several miles lower down the river than the present tunnel, and was a signal failure. Dodd's tunnel fell in, and has long been abandoned to the water. The idea, however, took root, and in 1805, the year of Trafalgar, a company was incorporated by Act of Parliament, under the name of the "Thames Archway Company," with the object of forming an archway or tunnel beneath the bed of the river at Limehouse, sufficiently capacious to allow of the transit of vehicles through it. Under Mr. Vazie and Mr. Trevithick, great progress was made with the work. But in 1808, when a drift-way had been carried to within 200 feet of the opposite shore, the river broke in upon the works, and finally destroyed the whole undertaking. As early as 1814 the attention of Mr. Brunel was directed to the subject; and in 1823, backed up by the Duke of Wellington, he seriously submitted

to the public a plan for the construction of a tunnel. Mr. Bruhel had been engaged in constructing a small tunnel at Chatham, and passing one day through the yard, he observed a piece of wood which was perforated by the borings of a well-known sea-worm called the *Teredo navalis*, or *Calamitas navium*, as Linnæus named it. The thought occurred to him that a machine might be constructed, protected in a similar manner to the hard cylindrical shell of this worm, and which would tunnel with great rapidity. The idea was elaborately worked out, and though afterwards materially altered, was substantially the mode in which this great undertaking was completed.

The Act incorporating the company received the royal assent in June, 1824; but in consequence of a dispute relative to the site of the property required for the Rotherhithe shaft, the works were not actually commenced till February 16, 1825. A brick cylinder was first built on the Surrey side, 42 feet high, 150 feet in circumference, and 150 feet distant from the river. In the inside of this cylinder the excavators worked, cutting away the earth and supplying its place with brickwork, till they had reached a depth of 65 feet; another shaft was then sunk lower for experimental purposes, when, at a depth of 80 feet, the ground suddenly gave way, and sand and water were blown up with great violence. From this shaft the tunnel itself was begun, at a depth of 63 feet. Mr. Brunel proposed to make his tunnel 38 feet broad and 22½ feet high, leaving room within for two archways each 15 feet high, and each wide enough for a single carriage and a footpath. The men worked in a frame which Mr. Brunel called a shield, which was pushed forward from time to time by means of large horizontal screws, which abutted on the brickwork of the arch at the top, and against the inverted arch at the bottom. This shield was

divided in a very ingenious manner into cells, each of which was capable of being moved separately. "As the miners were at work at one end of the cells, the bricklayers at the back were as busy as bees in forming the brick walls of the tunnel top, sides, and bottom, the crushing earth above being fended off by the top of the shield till the bricklayers had finished. Following the shield was a rolling stage in each archway, for the assistance of the men in the upper cells." The work proceeded slowly, but without any serious interruption, to the 26th January, 1826, when water burst in; but, after some difficulty in stopping the leak, the water was pumped out, and the work was resumed, and continued without further interruption till early in September.

The arrangements not proving entirely effective, it was suggested to extend the action of the frames. To this Brunel was opposed, but circumstances combined to overrule his judgment, and to induce him to sanction what his first mechanical conceptions and his subsequent experience condemned. The extraordinary energy, ability, and enthusiasm of his son, Mr. Isambard Kingdom Brunel, who had been appointed resident engineer, seemed to offer to Brunel compensation for almost any departure from his original plan. The necessity for increased supervision, however, became more and more pressing. On the morning of Friday, September 8, 1826, water was observed to drop from the tails of some of the frames; this was checked by a stuffing of oakum. In two hours diluted silt made its appearance, and during the night it burst in with considerable force, so great as to require the united efforts of their men to retain the necessary stuffing in its place. The utmost vigilance was required for several days to keep the men at their post. On Monday, the 11th, the contest had again to be renewed; water and silt occasionally bursting from the back of the frames when any attempt was made to move on. Timbers were now introduced in front, where the ground was more solid, and, capped with clay, were forced up by

powerful screw-jacks. While this operation was going on in front, gravel and pieces of yellow mottled clay forced themselves in behind. Upon an effort being made to move forward the contiguous frames, water appeared in front in such abundance as to threaten destruction to the faces. To relieve the ground, borings were made through the brickwork of the centre pier, and pipes inserted at the back of the frames. After considerable labour, at ten o'clock on the night of the 11th, the object was attained, and the water flowed with great velocity, promising to relieve the pressure and to prevent the further dilution of the silt and clay. All was now in full activity; the din of workmen and the plashing of water, broken in its descent of twenty-two feet by the iron floor plates, was deafening, when suddenly the water ceased to flow; the workmen ceased their labour, and not a sound relieved the intensity of the silence. "We gazed on one another," said a narrator of the scene, who was present, "with a feeling not to be described. On every countenance astonishment, awe, perhaps, was depicted, but not fear. I saw that each man—with his eyes upon Isambard Brunel, the resident engineer, and then only twenty years of age—stood firmly prepared to execute his orders with resolution and intrepidity. In a few moments—moments like hours—a rumbling, gurgling sound was heard above; the water resumed its course, the awful stillness was broken, life and activity once more prevailed, and the works proceeded without further material interruption." The threatened catastrophe had passed over, and the work had now so far advanced that permission was given to strangers to visit the works; a shilling was charged, and they were allowed to proceed down the western archway about 300 feet. In May, 1827, however, came the long-expected disaster. Two vessels had anchored just above the head of the tunnel, and a great quantity of soil had been washed away from above the shields.

Mr. Beamish, the resident assistant

engineer, in his "Life of Brunel," thus describes the occurrence :—

"As the water rose with the tide it increased in the frames very considerably between Nos. 5 and 6, forcing its way at the front, then at the back; Ball and Compton (the occupants) most active. About a quarter before six o'clock, No. 11 (division) went forward. Clay appeared at the back. Had it closed up immediately. While this was going forward my attention was again drawn to No. 6, where I found the gravel forcing itself with the water. It was with the utmost difficulty that Ball could keep anything against the opening. Fearing that the pumpers would now become alarmed, as they had been once or twice before, and leave their post, I went upon the east stage to encourage them, and to choose more shoring for Ball. Goodwin, who was engaged at No. 11, where indications of a run appeared, called to Rogers, who was in the act of working down No. 9, to come to his assistance. But Rogers, having his second poling-board down, could not. Goodwin again called. I then said to Rogers, 'Don't you hear?' Upon which he left his poling for the purpose of assisting Goodwin; but before he could get to him, and before I could get fairly into the frames, there poured such an overwhelming volume of water and sludge as to force them out of the frames. William Carps, a bricklayer, who had gone to Goodwin's assistance, was knocked down and literally rolled out of the frames on the stage, as though he had come through a mill sluice, and would undoubtedly have fallen off the stage had I not caught hold of him, and with Rogers' assistance helped him down the ladder. I again made an attempt to get into the frames, calling upon the miners to follow; but all was dark (the lights at the frames and stage being all blown out), and I was only answered by the hoarse and angry sounds of Father Thames's roarings. Rogers (an old sergeant of the Guards), the only man left upon the stage, now caught my arm, and gently drawing me from the frames, said, 'Come away, pray, sir; come

away; 'tis no use, the water is rising fast.'

I turned once more; but hearing an increased rush at No. 6, and finding the column of water at Nos. 11 and 12 to be augmenting, I reluctantly descended. The cement casks, compo-boxes, and pieces of timber were floating around me. I turned into the west arch, where the enemy had not yet advanced so rapidly, and again looked towards the frames, lest some one might have been overtaken; but the cement casks, etc., striking my legs, threatened seriously to obstruct my retreat, and it was with some difficulty I reached the visitors' bar (a bar so placed as to keep the visitors from the unfinished works), where Mayo, Bertram, and others were anxiously waiting to receive me. . . . I was glad of their assistance; indeed, Mayo fairly dragged me over it. Not bearing the idea of so precipitate a retreat, I turned once more; but vain was the hope! The wave rolled onward and onward; the men retreated, and I followed. Met Gravatt coming down. Short was the question, and brief was the answer. As we approached I met I. [Isambard] Brunel. We turned round: the effect was splendid beyond description. The water as it rose became more and more vivid, from the reflected lights of the gas. As we reached the staircase a crash was heard, and then a rush of air at once extinguished all the lights. . . . Now it was that I experienced something like dread. I looked up the shaft, and saw both stairs crowded; I looked below, and beheld the overwhelming wave appearing to move with accumulated velocity.

Dreading the effect of the reaction of this wave from the back of the shaft upon our staircase, I exclaimed to Mr. Gravatt, 'The staircase will blow up!' I. Brunel ordered the men to get up with all expedition; and our feet were scarcely off the bottom stairs when the first flight, which we had just left, was swept away. Upon our reaching the top, a bustling noise assailed our ears, some calling for a raft, others for a boat, and others again a rope; from which it was evident that some unfor-

fortunate individual was in the water. I. Brunel instantly, with that presence of mind to which I have been more than once witness, slid down one of the iron ties, and after him Mr. Gravatt, each making a rope fast to old Tillet's waist, who, having been looking after the packing of the pumps below the shaft, was overtaken by the flood. He was soon placed out of danger. The roll was immediately called—*not one absent.*" Fortunately, no lives were lost; but this irruption was only the forerunner of another, attended with the most melancholy results, and which was preceded by an accident which troubled Mr. Brunel even more than the influx of water. On June 27, 1827, two of the directors, having expressed a wish to obtain a view of the shield, embarked in a small boat for that purpose, which was unfortunately overloaded and upset, and one of the party, a miner, was drowned. One of the most striking characteristics of Brunel's inventions was the means he provided for the protection of life, and, notwithstanding all the difficulties by which the operations of the tunnel were beset, no life had yet been sacrificed when the necessary care had been taken.

By January, 1828, the shield had advanced to the middle of the river. Mr. I. K. Brunel, the son of the great engineer, judging that a more rapid rate of progress would also be more safe, and calculating on the tried skill, courage, and physical power of some of the men coming on in the morning shift on January 12, 1828, ventured at high-water, or when the tide was still rising, to make an important advance; but the shield was not, as was afterwards proved, thoroughly well secured. In a short time a column of ground, eight or ten inches in diameter, was forced in, and this was immediately followed by the overwhelming torrent. So rapid was the influx of water, that had not the workmen quitted the stage immediately, they must have been swept off; a rush of air suddenly extinguished the gas lights, and they were left to struggle in utter darkness. Five men were drowned, and the tunnel was again filled

with water. One of the great advantages which Brunel believed the shield possessed was the security it afforded to life; but, unhappily, the confidence which that supposed security inspired supplied a temptation to incur risks against which no protection would avail. In a letter to the directors Mr. Brunel, jun., described the scene as follows:—"I had been in the frames with the workmen throughout the whole night, having taken my station there at ten o'clock. During the workings through the night no symptoms of insecurity appeared. At six o'clock in the morning (the usual time for shifting the men) a fresh set came on to work. We began to work the ground at the west top corner of the frame. The tide had just then begun to flow, and finding the ground tolerably quiet, we proceeded by beginning at the top, and had worked about a foot downwards, when, on exposing the next six inches, the ground swelled suddenly, and a large quantity burst through the opening thus made. This was followed instantly by a large body of water. The rush was so violent as to force the man on the spot where the burst took place out of the frame (or cell) on to the timber stage behind the frames. I was in the frame with the man; but upon the rush of the water I went into the next box, in order to command a better view of the irruption; and seeing there was no possibility of their opposing the water, I ordered all the men in the frames to retire. All were retiring except the three men who were with me, and they retreated with me. I did not leave the stage until those three men were down the ladder of the frames, when they and I proceeded about twenty feet along the west arch of the tunnel. At this moment the agitation of the air by the rush of the water was such as to extinguish all the lights, and the water had gained the height of the middle of our waists. I was at that moment giving directions to the three men, in what manner they ought to proceed in the dark to effect their escape, when they and I were knocked down and covered by a part of the timber stage. I struggled under water for some time, and at

length extricated myself from the stage ; and by swimming and being forced by the water, I gained the eastern arch, where I got a better footing, and was enabled, by laying hold of the railway rope, to pause a little, in the hope of encouraging the men who had been knocked down at the same time with myself. This I endeavoured to do by calling to them. Before I reached the shaft the water had risen so rapidly that I was out of my depth, and therefore swam to the visitors' stairs, the stairs of the workmen being occupied by those who had so far escaped. My knee was so injured by the timber stage that I could scarcely swim or get up the stairs, but *the rush of the water carried me up the shaft*. The three men who had been knocked down with me were unable to extricate themselves, and I grieve to say they are lost, and, I believe, also two old men and one young man in other parts of the work." To fill up the hole and regain the frames, Brunel resorted to the means which had proved so successful after the former irruption, and about 4,500 tons of clay and gravel were absorbed by the hole. The same alarms, anxieties, and fatigues were again experienced, pressing only more heavily in consequence of being deprived of the active superintendence of Isambard Brunel, who had been severely injured in the late accident. The next irruption was in November, 1837, and the last in April, 1840, about eight in the morning, it being low water at the time. During a movement of the poling-boards in the shield, a quantity of gravel and water rushed into the frame. "The ground rushed in immediately, and knocked the men out of their cells, and they fled in a panic ; but finding the water did not follow, they returned, and by great exertions succeeded in stopping the run when upwards of 6,000 cubic feet of ground had fallen into the tunnel. The fall was attended with a noise like thunder, and the extinguishing of all the lights. At the same time, to the horror of Wapping, part of the shore in that place sank, over an area of upwards of 700 feet, leaving a cavity

on the shore of about thirty feet in diameter and thirteen feet in depth. Had this taken place at high water, the tunnel would have been filled ; as it was, men were sent over with bags of clay and gravel, and everything was rendered secure by the return of the tide. Sometimes sand, nearly fluid, would ooze through minute cracks between the small poling-boards of the shield, and leave large cavities in the ground in front. On one of these occasions the sand poured in all night, and filled the bottom of the shield. In the morning, on opening one of the faces, a hollow was discovered, eighteen feet long, six feet high, and six feet deep. This cavity was filled up with brickbats and lumps of clay. One of the miners was compelled to lay himself down in this cavity, for the purpose of building up the further end, though at the risk of being buried alive."

While all this was taking place, the funds of the company had become exhausted, and an appeal was made to the country. A public meeting was held, attended by the Duke of Cambridge, the Duke of Wellington, and many other noblemen and gentlemen of distinction. The Duke of Wellington proposed a series of resolutions expressing his confidence that the great work would be crowned with success. "Of my own knowledge," said his Grace, "I can speak of the interest excited in foreign nations for the welfare and success of this great undertaking. They look upon it as the greatest work of art ever undertaken." The result of this meeting was that £18,500 was at once subscribed, but the scheme to raise money on debentures completely failed. Up to that time the company had raised and expended a total of £170,000, and the public rightly thought the security for a further outlay was very uncertain. The water having been cleared out of the tunnel, a mirror was placed at the end of the visitors' arch, and which, having been stuccoed and lighted with gas, continued to be an object of great attraction to visitors from all parts of the world. At last Government consented to make a loan of

£246,000 to the Tunnel Company, under the condition that the money "should be solely applied in carrying on the tunnel itself, and that no advance should be applied to the defraying of any other expense until that part of the undertaking which is most hazardous shall be secured." Isambard Brunel was then too much engaged in railway undertakings to permit his giving assistance to his father, and Mr. Beamish succeeded him in that office, and had the honour of completing the tunnel. The work was continued, with varying fortunes, till March 25, 1843, when it was opened to the public.

The total length of the tunnel is 1,200

feet; its cost from first to last was about £450,000, of which £180,000 was subscribed or lent, and the remainder advanced by Government. "The carriage ways were originally intended to consist of an immense spiral road, winding twice round a circular excavation 57 feet deep, in order to reach the proper level. The extreme diameter of this spiral road was to be no less than 200 feet. The road itself was to have been 40 feet wide, and the descent very moderate;" but as the work proceeded, the plans were very much modified. The tunnel now forms part of the East London Railway, between Wapping and Rotherhithe stations.

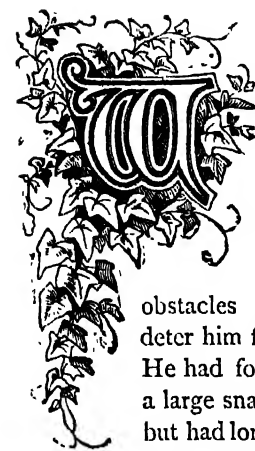


A NATURAL TEMPLE.

WITHIN the state of California there is a perfect natural theatre, almost as symmetrical in arrangement as if it had been artificially erected! It is at a place called Temple Canon, some four and a half miles from Canon City, and was discovered but a year or two ago. The climb is not steep, though rather rough, especially to effect an entrance into the temple proper, which can only be accomplished by clambering over several huge boulders, which, if removed, would render the illusion of a temple and stairway all the more striking. Once passing in through the great rifts of rock, for all the world like the stairway to some grand place of amusement, the body of the temple is reached, and to the tourist's astonishment, before him is a stage with overhanging arch, with "flats" and "flies," with dressing-rooms on either side, and a scene already set as if for some grand tableau. If so intensely realistic from the parquet, as the broad circling floor might aptly be termed, or from the parquet or dress-circles, as the higher ledges would suggest, the clamber up to the stage itself renders it all the more

so, for there is found ample room for a full dramatic or operatic company to disport upon, while in the perpendicular ledges and caves on either side twenty-five or thirty people might retire and not be observed from the body of the hall. The stage is at the least thirty feet deep, and some sixty to seventy broad; the arch above fully one hundred feet from the floor of the canon, the stage itself being about forty feet above the floor. The arch is almost as smooth and perfectly proportioned as if fashioned by the hand of man, and during the wet season the water from a stream above falls in a great broad sheet over its face to the floor of the canon below. At such times the effects from the stage of the temple is, as can be imagined, exceedingly fascinating, for there, entirely protected from the water, one looks through the silvery sheen out upon the scene below. Upon the rear wall of the stage quite an aperture has been hewn out by some action, and the shape it is left in is peculiarly suggestive of tableaux preparation. All is bleak, bare, and towering walls, and a more weird spot to visit cannot possibly be imagined.

A SNAKE CAPTURE.



ATERTON, the naturalist, was a man of wonderful courage. When he had once made up his mind to a certain course, no obstacles or dangers could deter him from carrying it out. He had formed a wish to add a large snake to his collection, but had long been disappointed in catching one. At last he was told by an old negro that a huge serpent was lying amongst some mouldering trunks. Accompanied by two negroes and a little dog, he immediately started to capture it. How he succeeded will be best told in his own words, merely premising that the snake was of a rare kind called a coulacanara; that it was about fourteen feet in length, and strong enough to crush a single man to death. He confessed that when he first saw this monster he was alarmed.

"But I had been in search of a large serpent for years, and now, having come up with one, it did not become me to turn soft; so, taking a cutlass from one of the negroes, and ranging both the sable slaves behind me, I told them to follow me, and threatened I would cut them down if they offered to fly. I smiled as I said this, but they shook their heads in silence, and seemed to have a bad heart of it.

When we got up to the place, the serpent had not stirred, but I could see nothing of his head, and judged by the folds of his body that it must be at the farthest side of his den. A species of woodbine had formed a complete mantle over the branches of a fallen tree, almost impervious to the rain or the rays of the sun. Probably it had resorted to this sequestered place for a length of time, as it bore marks of an ancient settlement.

I now took my knife, determining to cut away the woodbine and break the twigs in the gentlest manner possible, till I could get a view of his head. One negro stood guard close behind me with a lance, and near him the other with a cutlass. The cutlass which I had taken from the first negro was on the ground close by me in case of need. After working in dead silence for a quarter of an hour, with one knee all the time on the ground, I had cleared away enough to see his head. It appeared coming out between the first and second coil of his body, and was flat on the ground. This was the very position I wished it to be in.

I rose in silence, and retreated very slowly, making a sign to the negroes to do the same. The dog was sitting at a distance in mute observation. I could now read in the faces of the negroes that they considered this a very unpleasant affair, and they made another attempt to persuade me to let them go for a gun. I smiled in a good-natured manner, and made a feint to cut them down with the weapon I had in my hand. This was all the answer I made to their request, and they looked very uneasy. It must be observed we were now about twenty yards from the snake's den. I now ranged the negroes behind me, and told him who stood next to me to lay hold of the lance the moment I struck the snake, and that the other must attend my movements. It now only remained to take their cutlasses from them, for I was sure, if I did not disarm them, they would be tempted to strike the snake in time of danger, and thus for ever spoil his skin. On taking their cutlasses from them, if I might judge from their physiognomy, they seemed to consider it a most intolerable act of tyranny in me. Probably nothing kept them from bolting but the consolation that I was between them and

the snake. Indeed, my own heart, in spite of all I could do, beat quicker than usual ; and I felt those sensations which one has on board a merchant vessel in war-time, when the captain orders all hands on deck to prepare for action, while a strange vessel is coming down upon us under suspicious colours.

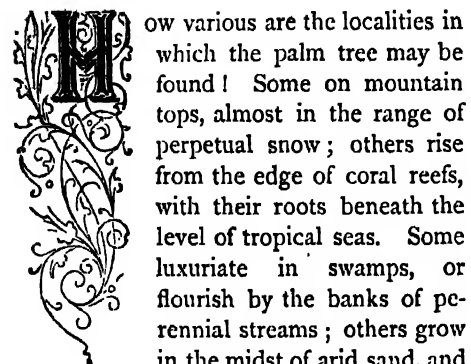
We went slowly on in silence, without moving our arms or heads, in order to prevent all alarm as much as possible, lest the snake should glide off or attack us in self-defence. I carried the lance perpendicularly before me, with the point a foot from the ground. The snake had not moved, and on getting up to him, I struck him with the lance on the near side, just behind the neck, and pinned him to the ground. That moment the negro next to me seized the lance, and held it firm in its place, while I dashed head foremost into the den to grapple with the snake, and took hold of his tail before he could do any mischief. On pinning him to the ground with the lance, he gave a tremendous loud hiss, and the dog ran away, howling as he went. We had a sharp fray in the den, the rotten sticks flying on all sides, and each party struggling for superiority. I called out to the second negro to throw himself upon me, as I found I was not heavy enough ; he did so, and the additional weight was of great service. I had now got firm hold of his tail ; and after a violent struggle or two, he gave in, finding himself overpowered. This was the moment to secure him ; so, while the first negro continued to hold the lance firm to the ground, and the other was helping me, I contrived to unloose my braces, and tied up the snake's mouth.

The snake, now finding himself in an unpleasant situation, tried to better himself, and set resolutely to work ; but we overpowered him. We contrived to make him twist himself round the shaft of the lance, and then prepared to convey him out of the forest. I stood at his head, and held it firmly under my arm ; one negro

supported the belly, and the other the tail. In this order we began moving slowly towards home, and reached it after resting ten times, for the snake was too heavy for us to support him without stopping to recruit our strength. As we proceeded onwards with him, he fought hard for freedom, but it was all in vain. The day was now too far spent to think of dissecting him. Had I killed him, a partial putrefaction would have taken place before morning. I had brought up with me into the forest a strong bag, large enough to contain any animal that I should want to dissect. I considered this the best mode of keeping live animals when I am pressed for daylight, for as the bag yielded in every direction to their efforts, they would have nothing solid or fixed to work upon, and thus would be prevented from making a hole through it. I say fixed, for the mouth of the bag was closed ; the bag itself was not fastened or tied to anything, but moved about wherever the animal itself caused it to roll. After securing afresh the mouth of the coulacanara, so that he could not open it, he was forced into the bag, and left to his fate till morning.

I cannot say he allowed me to have a quiet night. My hammock was in the loft just above him, and the floor between us half gone to decay, so that in parts of it no boards intervened betwixt his lodging-room and mine. He was very restless and fretful, and had Medusa been my wife, there could not have been more continued or disagreeable hissing in the bed-chamber that night. At daybreak I sent to borrow ten of the negroes who were cutting wood at a distance. I could have done with half that number, but judged it prudent to have a good force in case he should try to escape from the house when we opened the bag. However, nothing serious occurred. We untied the mouth of the bag, kept him down by main force, and then I cut his throat. He bled like an ox. By six o'clock the same evening he was completely dissected."

THE PALM AND ITS USES.



How various are the localities in which the palm tree may be found! Some on mountain tops, almost in the range of perpetual snow; others rise from the edge of coral reefs, with their roots beneath the level of tropical seas. Some luxuriate in swamps, or flourish by the banks of perennial streams; others grow in the midst of arid sand, and amidst pathless deserts. In habit some are solitary, others gregarious. No order of plants, in short, is so varied in circumstances of growth, and so little reducible in this respect to rules and generalisations.

More remarkable still are the palms in their economic uses to man. In some parts of the world the inhabitants would be almost incapable of existing without them. They afford food, clothing, furniture, weapons, and every implement and appliance that raises man above the purest savage state. Here are some of the multitudinous uses of the cocoa-nut tree:—The heart, or very young leaves, called the “cabbage,” is an excellent vegetable, either cooked or dressed in stews, hashes, or ragouts. The Cingalese use the dried, old leaves as torches, both for themselves during the dark nights and to carry before the carriages and palanquins of Europeans; they also use the spathe for a similar purpose, as well as for fuel; and at Rotuma and other Polynesian islands it is also adopted for a like purpose. At Tongatabu, one of the Friendly Islands, combs are made of the midrib of the segments, the upper part being beautifully worked with the fibre of the husk, or *bulu*. “These combs, from their neat appearance, were,” says Bennett, “in great requisition during the time I visited that island, and all the women were busily employed during our stay in making them, to exchange with

the *papalangi* (foreign) officers and crew for trifling articles. The combs were stained by the bark of the *ko-ko*-tree of a dark reddish colour, intended as a rude imitation of tortoiseshell.”

The washermen of Ceylon burn the foliage for the sake of its alkaline ashes. The midribs of the leaves, when tied together, form brooms for the decks of ships. The Cingalese use the unexpanded leaves in forming ornaments on the occasion of any festival, decorating arches, etc., in various picturesque forms of crowns, flowers, etc.

There is one portion of the tree which much attracts the attention of the observer,—it is a kind of network at the base of the petiole, which when very young is delicate, beautifully white, and transparent, but when having attained maturity becomes coarse and tough, and changes to a brown colour. It is stripped off in large pieces, which are used in Ceylon as strainers, particularly for the toddy, which is usually full of impurities when first taken from the tree, as its sweetness attracts innumerable insects. At Tahiti it is called *Aa*; and besides being used as sieves for straining arrowroot, cocoa-nut oil, etc., the natives, when engaged in such occupations as digging, fishing, etc., in order to save their bark-cloth, join several portions of this network together, and having a hole in the centre, in a manner similar to their mat garment called *Tiabuta*, wear it as an article of apparel, merely for the time in which they may be so engaged. It is certainly a garment neither to be admired for its flexibility or firmness, but well adapted for fishermen, or those occupied in the water, as it is not easily injured by wet, whereas bark-cloth would be utterly destroyed in the water, its substance resembling paper both in strength and appearance.

A tree produces several bunches of nuts; and from twelve to twenty large nuts, be-



sides several small unproductive ones, may be seen on each bunch. In good situations the fruit is gathered four or five times in the course of the year. It is most used as an article of food, both meat and drink, when green or young (*oua* of the Tahitians, *koroomba* of the Cingalese); in that state it yields an abundance of a delicious cooling beverage, to which Madeira wine, brandy, etc., is sometimes added.

Passing over "toddy," *drack*, *omejar*, *jaggery* (coarse sugar), and other secondary products, the rind or husk of the cocoa-nut is very fibrous, and when ripe is the *roya* or *coir* of commerce, now so extensively used in Europe and North America for matting, brushes, hats, etc. It is prepared by being soaked for some months in water, washed, beaten to pieces, and then laid in the sun to dry. This being effected, it is again well beaten, until the fibres are so separated as to allow of their being worked up like hemp, similar to which it is made up in ropes of any size, from the smallest cord to the largest cable, but it will not receive tar; it is rough to handle, and has not so neat an appearance about the rigging of shipping as that made from hemp, but surpasses the latter in lightness and elasticity, and even, it is said, durability; more so if wetted frequently by salt water. From its elasticity it is valuable for cables, enabling a ship to ride easier than with a hemp or chain cable. Bennett remarks that he was once on board a ship, in a severe gale, when chain and hemp cables gave way; and the vessel at last, most unexpectedly, rode out the gale with a small coir cable. Among the Polynesian Islands, where this tree grows, the coir is used in the manufacture of sennit, some of which is beautifully braided, and devoted to a variety of purposes. At Tonga, one of the Friendly Islands, the natives dye the sennit, called "kafa," of various colours, using it in tying the rafters of the huts, etc. The rope for their canoes is all manufactured from this substance. The husk from which the fibrous substance has not been separated is used in Ceylon in lieu of scrubbing-

brushes for the floor; and brooms, mats, and bags are also manufactured from it.

Another valuable production of the cocoa-nut is the oil, which is an article of exportation from Ceylon and other parts of India, Polynesia, etc. It is used in various articles of domestic economy; besides being an excellent burning oil (for which it is most admired, giving out neither smoke nor smell when burning, and having a clear bright flame), it has since had an additional value and more extended use in Europe, by the discovery of its capability of being manufactured into candles, rivalling wax or spermaceti, at the same time without being much higher in price than those of tallow. Soap has also been manufactured from it; and it is lavished by the Asiatics, Polynesians, and other intertropical natives over their persons; and at Tongatabu and others of the Polynesian Islands is used scented with sandal-wood, which gives a delightful fragrance to the flowing tresses and elegant persons of the dark beauties of those fascinating islands. In cold weather this oil (like most of the vegetable oils) becomes very hard, and requires to be melted before it can be used for burning.

The date palm is largely distributed over Eastern lands, especially Egypt, Barbary, and Arabia. It is the most conspicuous object of the oases in the great African desert. It shoots up its straight and tapering stem, to the height of fifty, to sixty feet. The stem is marked by numerous ring-like ridges. The bright green leaves are on the top, and drop their feathery shapes like a canopy. A large group of flowers appears in what is called a spathe, one of which contains 12,000 blossoms; and three such clusters are found on each tree. One species of the palm is said to exhibit the great number of 200,000 flowerets in a single spathe.

This tree produces its fruit under its leaves. It begins to bear at about six years of age, and is fruitful for upwards of two hundred years. Each bunch of fruit weighs about twenty-five pounds, and one tree yields about a hundredweight every season. Dates are a principal article of

food in many parts of the East. They are eaten green, dried, or beaten into meal, and serve for food at all seasons of the year. The Arabs have a saying that "a good housewife may furnish her husband every day for a month with a dish of dates differently prepared." They also boast of its medicinal virtues. From the leaves they make couches, baskets, bags, mats,

and brushes; from the branches, cages for their poultry; from the fibres of the boughs, thread and rope; from the sap, a cooling drink; the body of the tree serves for fuel; and their camels are fed on the date-stones. Indeed, among the many useful trees given by the kind providence of God to the eastern people, there is not one more serviceable or more prized.

BICYCLES AND VELOCIPEDES.



URING the last few years the use of bicycles has become very popular. They are simply a development of the old "ranton," or three-wheeled velocipede. These old-fashioned vehicles sometimes did good work. In 1862 two men came from Bristol on one velocipede to London, on a visit to the International Exhibition, accomplishing the journey in twenty-one hours, and returning easily in eighteen. The two-wheeled variety, however, has far outstripped this, and it is by no means unusual for eighteen miles an hour to be accomplished by it. Paris is all alive with this machine. In the Bois de Boulogne, and on the suburban roads near the capital, such races are conducted under all sorts of conditions. As a skilful bicyclist can easily do his twelve or fourteen miles an hour, and can continue this for four or five hours at a stretch, there is certainly a potentiality of contesting a rather formidable race. In one instance a Frenchman accomplished 123 miles right off. When the velocipede first made its appearance in England, which was nearly half a century ago, the "dandy horse" was the suggestive designation bestowed on it. That was the period when that now extinct biped the dandy flourished. Then it was that the class who now form the "fast men" about town made most

characteristic demonstrations in the matter of dress. They wore black velvet stocks, six inches in width, in lieu of neckties, and carried their shirt collars up to the level of their eyebrows. The rest of their attire was in keeping with the extravagant neck-gear; huge high-crowned cylinders, all but guiltless of rims, covered the head; a full-breasted frill seemed bursting like a pigeon's crop from the feeble embrace of a scanty vest of light buff; the dress-coat of blue cloth, with its burnished yellow buttons, hung down behind in a point like a pheasant's tail; the waist was compressed with stays tightly laced in to the narrowest dimensions, and contrasted with a pair of balloon-shaped pants, full-blown at the hips, and growing small by degrees and beautifully less until they terminated in high-heeled Wellingtons armed with solid iron tips which made an incessant clatter on the pavements. This *tout ensemble* was accounted "the thing"—and whoever desires to contemplate it in its picturesque proportions has only to refer to the caricatures of the period.

Who was the inventor of the new toy we have not been able to learn, nor is it by any means certain whether it was really invented at the above date, or was simply a restoration of an old hobby. It began to be popular in the west of England about the close of the year 1820, and during the general excitement on the subject of the trial of Queen Caroline was made the medium of sundry political jokes of a very doubtful

kind, with which the names of Brougham, Majocchi (my jockey), and others were whimsically connected.

The machine consists of two wheels, each about three-fourths of a yard in diameter, placed in the same line, one exactly following the other, their axles turning in strong iron frames fixed to a long wooden shaft above them, and parallel with their line of revolution. The shaft, which curved upwards in front and downwards in the centre, was fitted with a cushion or pad on which the rider rested his arms, and bore a saddle in the centre which he bestrode. The front wheel turned easily, like that of a modern perambulator, and its motions were regulated by means of a handle so placed that it could be grasped by both hands, while the arms rested on the pad, the width of which pad was about eighteen inches. The feet of the rider touched the ground, the height of his horse being so adjusted as to enable him to walk freely with it between his legs. There were no treadles, or any other mode of propulsion than by "punting" the ground, as it were, with the feet; and as the rider had to balance himself as he went along—for the horse would fall prostrate if unsupported—it was no easy matter for a novice to keep the saddle. But the difficulty was got over by perseverance: if the horse was falling to one side a pressure on the pad on the opposite side would restore the equilibrium; or if that failed, a rapid turn of the guiding wheel in the direction of gravitation would effect the desired object. It was the custom to let the machines out to hire for the benefit of the young fellows who emulated each other in their displays of equitation during the long summer evenings. Broken heads, bruised elbows, scarified shins and other small casualties usually resulted from these displays, and now and then an ambitious aspirant, more plucky than prudent, would have to be borne off the ground and led home to be doctored.

As the management of the machine became better understood, its real capabilities began to be tested, and accomplished equestrians boldly undertook long journeys,

and performed them, too, in a manner more or less satisfactory. One young gentleman, we remember, travelled to a town fifty miles distant in a single day; but it was noticed that he did not make the return journey by the same conveyance, but came back ingloriously on the top of the stage-coach. The truth was, that the common roads of that day were not at all adapted for such a mode of progress, especially when speed was an object; the dandy horse had no springs, and as a consequence the roughness of the roads was apt to register itself in a series of bodily bruises and contusions not at all pleasant to endure.

To excel in this species of equitation it was necessary that the rider should possess a tall and slender figure and a convenient length of leg. Performers were not wanting who were qualified by nature in these respects, and it was really an agreeable sight to watch their graceful evolutions, connected, as they sometimes were, with feats of no small risk and daring. In some measure the performers, when seen in action on ground suited to the purpose, might be compared to skaters on a field of ice. A really clever rider, like the accomplished skater, could disport himself gracefully and rapidly upon a very small area—cutting figures on the pavement, and tying knots, as it were, by his swift and whirling movements. There was a young artist residing in Bath, whose exhibitions of skill in this way were marvellous to witness, and who generally made his appearance on the flagstones of the North Parade about sundown in summer, where a numerous circle of admirers would await his coming. Now and then a race would come off between a number of competitors—the course generally chosen being a very slight incline of a mile and a half—the riders starting up, and returning down the hill. It was rather heavy punting to get rapidly up the ascent, but no effort was needed to come down, as the rider had only to sit still and preserve an even balance with his feet on the axletree of the front wheel, and allow the machine to take its course. But in a race, the racer would of

course resort to punting even in going down, in order to distance his fellows ; and herein lay the danger, for if the foot struck the ground with any force while going ten or twelve miles an hour, the shock was likely to pitch the rider from the saddle, to divorce him from his steed, and perhaps do serious damage to both.

The pleasure of this exercise depended very much upon the progress the rider had made in the art of managing his unconscious nag. Hundreds of persons who began experiments with the expectation of doing wonders threw them up in disgust after a few trials, and hundreds more, after persevering for weeks and months without sufficiently mastering the art, were fain to abandon it. On level ground most persons could do pretty well after a few lessons, but there was very little enjoyment to be got out of a level run unless the ground was perfectly hard and smooth, and the rider had learned by experience how to economise his powers. In ascents at all steep the punting was sheer hard work, and if the incline was steep and long the best plan was to alight from the saddle and push the horse up the hill. This was compared by the critics to a man's carrying his own horse instead of being carried by him—but in fact it was far easier to walk up the hill with the horse than without it, as by leaning on the pad most of your weight was transferred to the wheels. But whatever might be the trouble of the ascent, there was ample compensation in coming down again, when you had nothing to do but sit still and be whirled onwards. One precaution, however, was necessary, and that was to be sure, in the first instance, that the hill you were to descend was not too steep.

- It happened on a certain afternoon that one of the best riders in the town where the writer was then living set out for a village about four miles distant, and seated at the summit of an ascent above a mile in length. He had no trouble in reaching his destination, and after resting awhile set out on his return. Suspecting no danger, he began the down-hill roll, and ere a couple

of minutes had elapsed found himself thundering along at a frightful pace. He had no means of stopping or even of retarding his career, as to have put foot to the ground would have been to be thrown, and all he could do was to guide himself over the smoothest part of the ground and keep clear of obstacles. But the momentum added every instant to the velocity of his flight, while the level ground yet lay far in advance. Still, by careful piloting and balancing he kept his seat, though now advancing in bounds with the ground sinking under him. He would probably have escaped with a whole skin, had it not been that the road took a sudden turn to the left just at the foot of the hill ; but by the time he had reached the turn his pace had become so furious that the guiding wheel had lost its hold of the ground, and could not avail to turn him in his course. The consequence was that the machine dashed right on ahead, flew up a little grassy bank, and crashed through the drawing-room window of a gentleman's house, carrying away the sash, scattering the glass in ten thousand fragments, and depositing the unexpected visitor, bruised, bleeding, and bewildered, in the centre of a small tea-party. Had he missed the window, and encountered the stone walls, he had most likely been killed on the spot ; fortunately, however, he came off without any very serious injury. This man was one of the most accomplished riders of the day ; one of his exploits, which bore the look of extreme peril, though it was really less dangerous to the rider than to the machine, was to kneel upon the saddle, and then to stand upright upon it, while going at a quick pace down a gentle declivity, balancing himself without the aid of the pad, and guiding his course by means of cords attached to the handle of the driving wheel.

Such was the velocipede of our boyhood. If it did not decline as rapidly as it came into fashion, it yet disappeared gradually, and, as to its original form, had vanished in the course of a few years. There were several causes that had a share in setting it

aside. In the first place, as it grew common it became a nuisance to pedestrians; it could only be used advantageously on smooth and firm ground, and the riders therefore made choice of the flat flagstones of the foot-pavements or the gravel walks of the parks and suburbs. This led to complaints [but too well founded from the promenading gentry, and then to interference by the municipal authorities, who dealt a fatal blow to the dandy horse by sweeping it summarily from the footways, and limiting its exertions to certain specified localities. Another cause of declension was the injurious effects of such riding as we have described upon the bodily health. Severe cases of rupture and many other painful disorders were proved to have thus originated, and the verdict of medical men was unanimous in condemning the pastime.

The two-wheeled velocipede had hardly subsided, when the three-wheeler made its appearance. It was constructed on a different plan entirely—the driving wheel being turned by the action of treadles, the saddle replaced by a comfortable seat—the feet of the rider being always clear of the ground. But it was, and is (for it still exists), but a meek and tame affair compared with the two-wheeler, being capable neither of the high speed nor the elegant evolutions of the original invention. For full forty years past this machine has been seen at intervals in the suburbs of London; it is generally an article of home manufacture, being constructed for the most part by the rider, who has produced it for his own gratification, and has added some modifications or improvements of his own contrivance. Commonly it carries but a single person, who is given to stopping at suburban public-houses in order to recruit his driving power by a glass of ale; but sometimes it carries double, the riders relieving each other at the treadmill. Some few years back we encountered in the Green Lanes near Stoke Newington, a huge family velocipede, having two driving wheels, each six feet in height; between the tall wheels

sat paterfamilias and his biggest boy, working most energetically, not treadles, but manuals—while materfamilias and a goodly nest of little ones of various ages enjoyed themselves luxuriously in an open car at the rear.

In the Hyde Park Exhibition of 1851, a three-wheeled velocipede was forwarded from the town of Bedford: it was the only representative of its class in that tremendous gathering of industrial labours; and what is more remarkable, the only contribution sent by the flourishing town of Bedford to the World's Fair.

The modern bicycle, however, which has been carried to such perfection of late years, is a marvel of workmanship and finish. The machines used in racing sometimes weigh only 25 lbs., with a 50 to 54-inch driving wheel, and the ordinary roadsters of the same size from 40 to 60 lbs. It is calculated that there are now more than 100,000 bicycles in the United Kingdom, and at the Hampton Court meet of London clubs held in this year, nearly two thousand riders of the silent "iron steed" appeared in the chestnut avenue of Bushey Park, and the long ranks of their bright machines, glinting in the sunshine, made up what spectators pronounced to be a very pretty sight.

With respect to the pleasure to be derived from riding these machines, there can be but one opinion, and their ever-increasing popularity will sufficiently attest it. Already tourists have penetrated into every nook and corner of old England, gathering stores of health from their exertions, and some have even penetrated France, Germany, Italy, and Switzerland. There is a great charm to a good rider in feeling so entirely independent to go wherever he may choose, and be able to cover, without much fatigue, a distance of 100 miles a day, and have a good view of the country through which he is passing from his elevated position.

In racing, one mile has been covered in 2 m. 43 s., and in a road race from Bath to London the winner performed the distance of 105 miles in 8 h. 23 m.



THE PERILS OF DIVING.

THE occupation of a diver is necessarily a very dangerous one. Many stories are told of the hair-breadth escapes which have happened to members of this class. Besides the risk of accidents from damage to the water-tight clothing, or to the machinery above, there is the danger of falling into crevices in the ground, and in some waters from voracious fish. Sharks are usually the aggressors in these cases; though, as will be seen from the following anecdote, told by a diver at Concepcion, in South America, not invariably.

In the bays and seaports of South America may generally be seen playing among the shipping the animal called the "bottle-nosed" whale. Never being meddled with, they are very numerous. Once or twice these huge animals had annoyed this diver, and even endangered his life, in the following singular manner, told in his own words:—

"Once I was caulking the side of a schooner I had been stopping a leak in. I was sitting comfortably enough on my stage hard at work, when a shadow fell on me, and on looking round I saw a monstrous object, like the submerged hull of another vessel, rounding her stern close to me. Antonio, that's the man who pumps the air down—was in his boat, but could do nothing. Slowly the huge creature's head approached, and I was in hopes it would proceed on. But, apparently struck by the sight of my helmet, and a red flannel over-all shirt I was wearing, it stopped and stared at me as if trying to make out what on earth—or rather under water—I was doing there. I was not at all pleased with

this visit, for the play of its huge fins—or paddles, rather—caused a great swirling in the water, and I was terrified lest they should draw and catch the air tubing and break it, for presently it came closer still, and it was with difficulty I kept my balance, so strong were the currents made by their motion. The men on board were in a fright, and at first did not obey my signal to haul up quickly. At last they complied, and my visitor made off.

Once, however, I did not escape so easily. I have seen them pass near me hundreds of times, but they very seldom come so close as that. Sometimes, however, they will almost touch the ship's side, though I never myself knew them to do what a Russian captain witnessed. I was a boy when Kotzebue visited this country, and he told me that in Concepcion Bay one rested against his brig for fully three minutes, perhaps mistaking her hull for another whale. You may see the occurrence mentioned in his book.

One day, however, I saw one almost do the same thing, for he came alongside and remained stationary, and so close that I was afraid he would compress the air-tubing between his body and the hull. He was within my reach, and I took up from the stage where it lay an auger I had been working with, and let drive into him with all the force in my power. It would have been wiser, however, if I had been more gentle, for the sudden start, and the whisk he gave with his flukes as they rushed past, upset me off the stage. Most fortunately the affair only occupied a few seconds, else it would have been all up with me. I had a rope round me, and was quickly hauled to the surface, but I was half dead when they got me on deck."

Mackerel, it is well known, are very inquisitive fish, and singularly enough cannot resist the sight of red. This peculiarity

once led to an adventure that might have ended tragically :—

“Another day I was attacked in a very extraordinary manner. I said just now that I once had on a red shirt, which I put on over all. I take care never to wear one now. I was busy with an auger boring a hole, when I felt a tug at my arm, and before I could well realise what was the matter, I felt a dozen similar tugs in different parts of my body. I was attacked by a shoal of mackerel—it seems that red is a colour that always attracts them—and before I could count ten I had as many of these fish clinging and biting furiously at me as could by any possibility find a spot to get hold of. I happened to be standing on a kind of ladder, and so powerfully did they drag at me, and so encumbered was I by the multitudes which hung from every part, that I had quite a job to mount it. Each fish here weighs a couple or three pounds, so you may fancy the pull when hundreds at once were at me.”

The vocation of the diver, however, is attended with greater perils than these. Once, when replacing some worn sheets of copper on the bottom of a whaling brig which had anchored in the bay for a few days, this man was visited by two monstrous sharks, who, however, kept at a respectful distance from his stage, awed perhaps by his strange figure and the noise of his blows on the metal. They had accompanied the brig for weeks, and followed her into harbour.

A very expert diver had been employed to recover the treasure from the Peninsular and Oriental Company's ship *Ara*, wrecked some years ago on the coast of Ceylon. Having, in a gutta percha dress made his way into the saloon, he was busy searching for the bullion, when to his horror, he saw a huge ground shark come sailing in at the door. With great presence of mind he lay motionless on the locker, and watched it silently and grimly cruising about. One can well imagine his feelings when he saw its cold, green eyes fixed upon him, and felt it pushing against the leaden soles of

his boots and rubbing against his dress, the slightest puncture in which would have been certain destruction. After ten minutes of suspense, which must have seemed an age, during which the monster came back twice or thrice to have another look at him, his courage and coolness were rewarded by seeing him steering his way back as he came. Afterwards he always armed himself with a large dagger when he went down to the wreck, from which he recovered altogether £220,000, having spent 850 hours under water.

Those who have read Victor Hugo's “*Les Misérables*” will remember his fearfully vivid description of a combat with the *pieuvre*, or cuttle-fish. Such things sometimes occur in reality to divers, when engaged in exploring the broken ground which this creature particularly frequents.

“The only time,” said the diver who told the story, “that I was ever really frightened—really in great danger—was once up in the north of Peru, where I had gone to recover a case of valuable ore and silver in bars, which has been lost some years before while being hoisted into the vessel. It was two days before I found it. It lay on a broad, flat-topped rock, in about three fathoms of water, and the wood was so rotted that I had to return for more hide ropes to lash round it before I could trust it to the chain and hooks. When I went up for these, the agent of the company to whom the ore belonged advised me to defer the job, as a norther had been long brewing, and the place was very exposed to swells; but after taking a good look at the weather, knowing that these northerly gales often last a week, and being anxious to finish the job—knowing, too, that it would not take long to do so—I resolved on descending. So over the boat's stern and down my ladder I went, and in a few minutes had the case securely lashed, after which I rolled and pushed it to the edge of the rock under the chain and hooks hanging from the boat's bows, slipped the hooks into the hide loops I had made, and then hastened to get off the rock (which

was only three feet or so in height) to go to my ladder; and it was high time to do so, for I felt that a heavy swell was now setting in, so that I could hardly keep my footing on the bottom. Perhaps you can imagine my feelings when I tell you that I had no sooner put my legs over the side of the rock—my feet had barely touched the ground—when I felt both ankles seized and held with irresistible power. I had been grasped by the tentacles, or arms, of a cuttle-fish, which had its lurking-place there.

Now you must know that I have an instinctive loathing of these creatures. I had seen them often enough, and generally they darted off the moment they caught sight of my figure. But this one had not been aware of my presence until my legs suddenly presented themselves before his eyes.

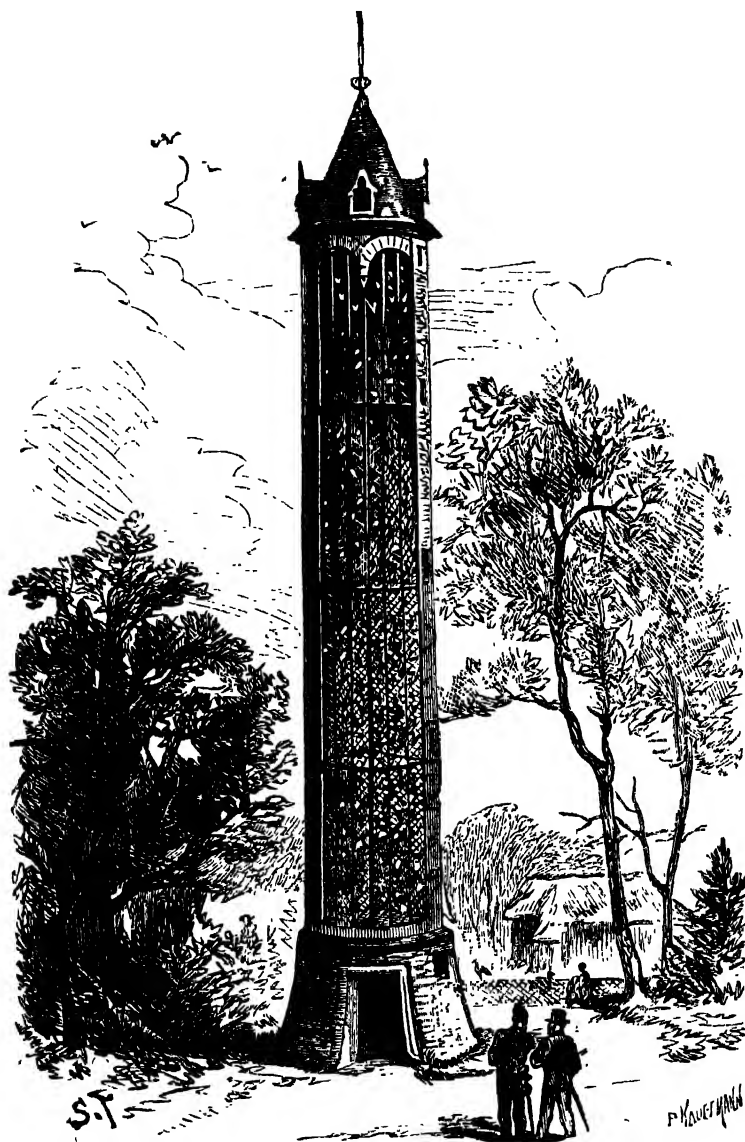
After the first few fruitless plunges I made to free myself, I turned almost faint with fear and a kind of horror and disgust; but this did not last long, for I soon got 'mad,' as the Yankees say, at the idea of being noosed, lassoed, and held prisoner there by such a puny creature as that. Although I had heard wonderful stories as to its extraordinary strength and ferocity when meddled with, I could not but think I should soon free myself, and again and again I tugged and strained, and pulled and pushed, but all in vain. Strong man as I am, I was powerless. I could not drag the creature from its holdfast on the rock, and I knew well that if I ventured my hands near, they too would be seized in that frightful grip, and I should be bound, hand and foot, like a poor boy in the south I had heard of, who, when gathering shellfish, was thus seized and held in a stooping position till the tide overwhelmed and drowned him.

Meantime most urgent signals were being made to me from above to hurry; and when I at last paused, breathless, after a long, frantic effort, I gave way to utter despair. But my faculties were still awake, and I observed that the creature would not loosen its hold by straight pushing or pull-

ing, and therefore determined to try and *screw* it off the rock. You see it was human intellect against superhuman strength.

I held on to the case, and with its aid tried, but soon found I could not manage it that way. The projecting edge of the rock hindered me. I therefore hit on another way. I pulled down some more of the chain out of the boat (I was sitting on the rock, you must remember), and then taking the case up on my knees, I let it down in front of me, and then tilted it over till it was at a proper distance, and then I left the rock and sat on the case. I was now opposite the beast, and could see that it held on by three of its tentacles, the other five being round my legs. These tentacles were not more than two feet long, and the creature's body was not bigger than my fist. Its eyes glared when it saw me, and it tried hard to bite, but the boots and thick stockings beat it.

Well, to make my story short, I turned and twisted, but I doubt if I should have got him to let go in time by that means alone. But I could now see it, and tried to crush and bruise the creature with my boots as well, but its tenacity was amazing. It was not till I picked up a long piece of slate stone off the bottom, and began in desperation to saw at its tentacles, that it at last let go. But it did so only to fasten all its suckers on me, and try more furiously than ever to bite me with its parrot-shaped bill. I succeeded, however, in keeping my hands and arms free, and I instantly made the signal to 'hoist away.' I kept tight hold of the chain, and was hoisted with the case, and very glad, though much astonished, they all were to see me ascend that way. I hastily explained what had happened, and they pulled me in, and while all haste was made by the rest to get ashore (for the first blast of the norther struck the boat as I got to the surface), Jacques (that's my man) cut the cuttle-fish away piecemeal, for pulling it off was out of the question, so tenaciously did it cling to the very last."



PIGEON HOUSE OF THE MILITARY PIGEON-POST, PARIS.

FLYING POSTMEN.



FROM very early periods of history the domesticated pigeon has been celebrated for its love of home, as well as for the remarkable certainty with which it made its way back from long distances to the spot where it was bred or kept. Even as far back as the middle ages, and

in ancient times, the pigeon post was known. The historian Diodorus Siculus, above two thousand years ago, speaks of pigeons as being employed for this purpose; and about five hundred years since, relays of carrier pigeons formed part of a telegraph system adopted by the Turks.

It is recorded that the Crusaders would

have failed to take the hotly-besieged city of Jerusalem had not a pigeon, which was sent to bring news to the besieged that the King of Persia was hastening to their help, fallen into their hands, and so led them to press on the siege before the Persian army arrived.

Many examples of power and speed in these birds, and of the certainty with which they return from incredible distances to the place where they were bred, are on record. These wonderful powers have been made use of both in war and commerce. The most extraordinary instance we know of is that of a carrier pigeon despatched by Captain Sir John Ross from his Arctic winter quarters in 1850, which reached its home near Ayr, in Scotland, in five days. Sir John took with him four of these pigeons, belonging to a lady residing in Ayrshire, intending to liberate two of them when he should go into winter quarters, and the other two when he should have discovered Sir John Franklin. A pigeon made its appearance at the dovecote in Ayrshire, which the lady recognised by marks that left no doubt of its identity. It bore no billet, but there were indications of one having been torn away.

Some years ago the idea originated in Ceylon of employing carrier pigeons to bear despatches from the port of Galle, at which the steamers touched, to Colombo, the capital, seventy-two miles up the country. For many years these messengers continued to perform the duty. The road being almost a straight line, the birds usually accomplished the passage of the seventy-two miles (well laden with manuscript and printed slips) in from one to two hours. As soon as they arrived, a special flag was hoisted to announce the event, and every one hastened to the office to hear the overland news. During the Crimean war, it may be well supposed that intelligence had been most eagerly awaited; and when the despatch announcing the details of the fall of Sebastopol—so full of joy and grief for multitudes—reached the capital of the distant colony of Ceylon, great was the excitement. Orders

were immediately issued by the commander-in-chief for a royal salute to be fired in honour of the event, which was done accordingly on the faith of intelligence transmitted by no more regular channel than the carrier pigeon.

The Antwerp birds are considered the best for the purpose of carrying messages. The feathers of the wings are firm and broad, while the flight feathers so overlap that great resistance is offered to the air in rapid motion. All the pigeons employed as letter-carriers undergo a careful system of training. Their owners take the young birds, short distances at first, from their homes, to let them return, the direction being constantly varied. Any one much about London may often see men or boys with pigeons either carried in the hand or in paper bags or a basket, perhaps upon London Bridge, by St. Paul's, or other marked spot. The birds are thrown up into the air, when, circling round a few times, they make for home. These birds are mostly birds being trained for "homing birds." A good Antwerp, so it is stated, when fully grown and in good condition, will, under favourable conditions of wind and weather, travel about five hundred miles in twelve hours.

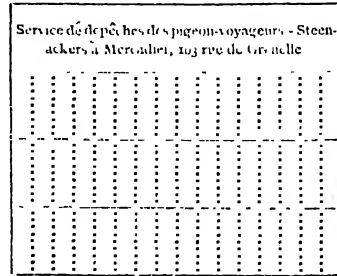
There is an account given of a race or match with pigeons which took place in the year 1865. The starting-point was Liverpool, the winning-point Ghent; the distance to be traversed, traced in a straight line, was just 500 miles. Thirty birds were started at half-past five in the morning. Some of the birds reached Ghent that same evening, having accomplished the distance in something like twelve hours and twenty minutes, or at a rough average of forty miles an hour. Others arrived about an hour after the first batch, and eight of the thirty were lost altogether.

• During the siege of Paris a regular service of message-carrying by pigeons was organized between the closely-beleaguered capital and the temporary seat of government at Tours. By the aid of the microscope and photography, an immense number of messages

may be readily carried by a single pigeon. A letter from Paris (January 11) says,—“The pigeon which arrived last Sunday brought in an immense mass of matter, and it has taken nearly two days to decipher all its messages. It brought in despatches for the Government, which, when printed, filled three or four columns of the newspapers; and, in addition, it has been the bearer of no less than 15,000 messages for private individuals! All this vast array of news has been reduced to microscopic size, and conveyed in a very small quill delicately attached to one of the bird's feathers. Never has a pigeon entered into a town bringing glad tidings to more people than the one which arrived on Sunday.”

Another mode of securing these photographic despatches was by rolling the paper round the middle feather of the tail, and neatly and securely fastening it. This feather was wisely chosen, because when the tail is spread during flight, the middle feather remains stationary, and is generally partly covered. It is only in alighting on a

tree that the tail is at all so extended that a gap occurs. On other feathers the number of the bird, place of its departure, and other notices, were stamped.



We give a diagram, the exact size of the original, of one of the pigeon-post despatches. Each space contained a complete missive. The letter was written in the ordinary way, and then reduced by photography to the size of one of the spaces. On arriving at its destination the despatch was enlarged and thrown upon a sheet by the aid of a magic-lantern, and the letters copied off by a staff of clerks.



DAYLIGHT FIREWORKS.

RESIDENT in Yokohama describes a marvellous display of daylight fireworks with which the Mikado's birthday, on November 3rd, was celebrated.

“The day cleared up beautifully bright and clear. In the distance, Fusivama, with its snow-capped crater, stood out sharp and distinct, and the whole was like a fairy scene. I was wholly unprepared for the agreeable surprise I experienced. On arrival at the public gardens in the rear of the settlement, I found a small inclosure screened off, and in this were placed the mortars, which deserve a special description. In Europe, these are usually made of copper or iron tubes, with a loose chamber

breech-piece of hard wood, forming a substantial base or bed; but here they were made of coopered staves, hooked with twisted bamboo rings, driven closely up from the breech to the muzzle in a regular taper, the entire construction being of wood.

There were half a dozen from 6 ft. to 9 ft. long and of corresponding calibre. The shells were of very different shapes and sizes: some globular, others cylindrical, and of different lengths, from 10 in. to 2 ft. The mortar being carefully vented and sponged, the *maître d'artifice* took a shell, and passing a line through two loops, one on each side of its upper part, held one end firm in his left hand while he carefully lowered it with his right. When the shell with its charge touched the base, he lifted it a little to make certain that it was ‘home,’ and withdrew

the line on his right hand. A match was inserted in the vent, and a portfire applied.

After watching several discharges, I found that in order to see the effect I must retire to some distance, and I now give you my recollections to the best of my ability.

Red and blue clouds.—A report from the mortar, and nothing visible for some seconds; when a shell bursts at an enormous altitude, spreading out two tufts of smoke, which enlarge and drift away in company: one bright red, and the other pale blue. The sun lights them up, and they pass away exactly like two real clouds. This was afterwards repeated with three, four, and five colours at once.

Cock-and-Hen—The shell bursts and discloses two balloons in the form of cock and hen, which circle round and round each other and drift away with the wind.

The Fiery Dragon.—This was very peculiar, and had a tail of smoke from some kind of a rocket which gave a snake-like motion to the figure. Streamers of enormous length and different colours unrolled themselves and drifted away.

The Flight of Herons.—This was without exception the most extraordinary thing I have ever seen. On the shell bursting there appeared something like the tail of a kite, but as the wind blew it out it assumed a perfect representation of a flock of wild fowl numbering some hundred or more, commencing with single file and near the end a V. As the wind was fresh, and moved the line in regular undulations, I could not tell with a good glass but what it was actually a flock of fowl going away down with the wind.

There were all kinds of birds, beasts, fishes, snakes, and men even came out of these shells. One of the most effective and difficult to describe was repeated several times. It consisted in a number of balls of quicksilver, shining bright in the sun like soap bubbles, which almost instantaneously disappeared. The shell burst, and nothing

was seen for an instant, when there appeared in a large circle, at perfectly equal distances apart, these silver balls, which vanished almost like electricity. It would, take a very long letter to describe each shell in a display that lasted three hours, but I think some of these 'fireworks' might be introduced at our summer *fêtes* at home with advantage, more especially so if the bright, clear atmosphere of Japan would follow too.

With the evening's display I was somewhat disappointed. It was needlessly spun out for more than five hours, several minutes elapsing between each discharge. The most effective was a large shell which burst with gold rain; a second, with a train of fire following, burst near the ground, and formed an enormous tree in gold fire. Another shell formed a large ball of fire, shooting stars in every direction until it fell near the ground. Shells which burst and distributed fifteen or twenty other shells with gold and silver rain, serpents, crackers, caduceas, etc., all were shot to an immense altitude, the 'fuzes' were splendidly timed, and there were no failures or accidents. A number of the fire brigade were in readiness in the event of any of the native houses taking fire. There were no magnesium parachutes, as at the Crystal Palace, and the coloured stars were poor; but, on the other hand, nothing that I have ever seen in Europe could compare with the regularity of distribution; each shell formed a star, palm-tree, or some kind of device; and when a number were scattered from one, the fuzes were exactly timed to form a pattern.

The crowd was large and orderly. As at home, there were vast numbers of women with babies, only here they carry them on their backs instead of in their arms. One little urchin of six years, or so, I lifted up to see a set piece; and he thanked me in good English, and told me he had learnt it at school."

THE TOWERS OF SILENCE.



INDOSTAN numbers among its cemeteries the Five Towers of Silence. These towers are the burial places of a very peculiar people—the Parsees, or fire-worshippers, a sect founded by a prophet who lived before the Moses of our Bible. They are of Persian descent, and are a rich and prosperous class of people, even though they do worship the sun, and believe that the earth represents God, and is too sacred to be their resting-place. Eating anything cooked by a person of another religion is contrary to their faith, and they object to beef and pork. Marriages can only be contracted with persons of their own caste or creed, and polygamy is forbidden. Long association with Europeans has, however, borne fruit lately in a very serious schism in the Parsee community. One party having become more liberal in their ideas, wish to make sundry innovations in their religion, which is still the worship of fire in much the same manner as it was observed by the first followers of Zoroaster, 2,500 year ago. These innovators are, however, stoutly resisted by the conservative section. Their mode of burial illustrates one of the peculiarities of their religion.

The Towers of Silence, or burial-places of the Parsees, are walled enclosures, containing one or more square towers built of grey stone. In the top of these towers is a spacious grating upon which the naked corpse is placed and left to be devoured by the crows and vultures and other birds of prey, who are in consequence attracted to this locality, and are always to be seen, in various stages of repletion, on the branches of the trees surrounding the cemetery.

There are five of these strange black granite towers just outside Bombay. They are tall columns, twelve or fifteen feet high

and forty feet wide, of solid stone, inclosing a deep well. Of course this leaves a large stone platform all around the mouth of the well. But I will let a recent traveller describe it:—

“Compartments, radiating like the spokes of a wheel from the well in the middle, are arranged on this platform in three rings or circles of open stone coffins. In the outermost circle are placed the bodies of men, in the middle those of women, and in the inner and smaller circle, nearest the wall, those of children.

The parapet of each tower has an extraordinary coping, formed, not of dead stone, but of living vultures. These birds, on the occasion of my visit, had settled themselves side by side in perfect order, and in a complete circle around the parapets of the towers, with their heads pointed inwards; and so lazily did they sit there, and so motionless were they, that, except for their colour, they might have been carved out of the stonework. Presently a sudden stir among the vultures made us raise our heads. At least a hundred birds collected round one of the towers began to show symptoms of excitement, while others swooped down from neighbouring trees. The cause of this soon revealed itself. A funeral was seen to be approaching.

You know that vultures live on the flesh of the dead, and the wonderful instinct which God has given them made them aware of the near approach of that on which they love to feed. These terrible birds have watched many a funeral to that lonely spot.

All the bodies of the Parsees are buried in the Towers of Silence. When a Parsee dies, the body is wrapped in a white sheet, and carried by bearers, dressed in pure white garments, to the garden, the friends following at some distance. The bearers then unlock the door of one of the towers and lay the body, uncovered, in one of the

open stone coffins, and then the vultures swoop down. A very short time suffices for these ravenous creatures to entomb the fleshy parts in their capacious maws, and the bones either fall, or are pushed through the grating, to join the other relics of mortality in the vault below.

It is said to be the custom for the mourning relatives and friends of the deceased to watch most anxiously the dispersion of the remains, to enable them to foretell, according to the order in which the several parts are disposed of, the future state of the soul now escaped from its earthly tenement. Great is the delight of the mourners if they

observe that the right eye is consumed before its fellow, as this is the best augury for complete happiness in the next world. In about three weeks the bearers return and remove the skeleton to the well, where the bones find their last resting-place.

This mode of disposal of the dead is, to my mind, a revolting custom, discreditable alike to the enlightened ideas of the Parsees, and to the Government that permits it. But owing to the policy we have hitherto pursued in India, to interfere as little as possible with the religious observances of the inhabitants, no check has been placed upon the practice."

EARTHQUAKES.



FIRE, air, and water confined in the earth have been named by various people as the different causes of these fearful phenomena. For aught

we know to the contrary, they may be produced by the union of all three. Their effects have been most terrible. Not to mention others, more than 100,000 lives were lost by an

earthquake in Sicily in 1693, and similar numbers have perished in single outbreaks in China and Japan. * Even our own country is not entirely free from these convulsions, though, so far as we know, no loss of life has resulted from them. Mrs. Somerville computes that 255 earthquakes have occurred in the British Isles, all slight. On April 8, 1750, to avoid the effects of a shock predicted by a madman, thousands of persons passed the night in Hyde Park. The earthquake at Lisbon, in 1755, is perhaps the best known of these tragedies; but we have full details of an occurrence of this kind at Aleppo, in Syria,

in 1822, which we give in the words of an eye-witness:—

"I was, at that time, asleep on the terrace of a particular friend, who, by the help of the Almighty, was mercifully saved, with all his family. About half an hour previous to the great shock, a light one was felt, when I took the precaution to draw my bed from under a very high wall, where it was placed. I was soon awakened by the fall of that wall on the very spot where my bed had stood. I sprang from my couch, and without waiting to dress myself, fled into the house, which I found falling on all sides.

To remain in the house, or to take flight through the streets amidst falling houses, appeared equally dangerous. I commended my soul to God, and embraced the latter resolution. In consequence, I descended the back stairs of the house, by the Almighty's guidance, for the front staircase fell at the same time.

The darkness of the night and the clouds of dust prevented me from perceiving the stones and rubbish on the stairs which had fallen from a part of the house; I stumbled, and was precipitated into the courtyard, and fell on a dead body. How

could I express my feelings at the moment, ignorant on what body I had fallen. I afterwards learnt that it was a faithful servant, who an instant before had descended those stairs, when some stone of an adjoining house fell on him and killed him.

Like a man deprived of his senses, I ran amidst the falling walls to the gate of the town, which was at some distance. On my way among the narrow streets, I witnessed the most horrible scenes. The lights of the houses, whose sides had fallen, exposed to view men and women clinging to the ruined walls of their houses, holding their children in their arms; mangled bodies lying under my feet, and piercing cries of half-buried people assailing my ears; Christians, Jews, and Turks were imploring the Almighty's mercy in their respective tongues, who, a minute before, perhaps, did not even acknowledge Him.

After great exertions, I arrived at the gate of the city, the earthquake still continuing. Naked and cold, and dreadfully bruised and cut in my body and feet, I fell on my knees, among a crowd of people, to thank the Almighty for my happy deliverance from the jaws of death. But the gate of the city was shut, and no one dared to risk his life under its arch, to open it. After commending my soul again to my Creator, I threw myself on the gate. I felt in the dark, and perceived that it was not locked; but the great iron bars that went across the folding-doors were bent by the earthquake, and the little strength I retained was not sufficient to force them. I went in quest of the guards, but they were no more.

I fell again on my knees before the Almighty, who alone could save me from the immediate perils of being crushed to death. I did not forget in my prayers the miserable creatures around me. While I was thus engaged, four or five Turks came near me, and joined hands to pray, in their accustomed way, calling out 'Alla! Alla!' I entreated them to help me to open the gate, in order to save the lives of those who were in danger of perishing.

The Lord inspired them with courage; and providing themselves with large stones, according to my instructions, in a little time they forced the bars and opened the gates. No sooner had I passed it, than a strong shock of an earthquake crumbled it to pieces, and several Jews were killed by its fall.

A new and affecting scene was now exhibited. A great crowd of people rushed out, and with one accord fell on their knees to render thanks to the Almighty for their preservation; but when the first transports of joy were over, the thought of having left their friends and relations buried in the city made them pour forth such piercing lamentations that the most hard hearted person would have been penetrated with grief. I crept, as well as I could, about twenty yards, to a place where I saw a group of people who had saved themselves from the suburbs, where no gates prevented their quitting the town; there I fell, half-dead with cold and with the pain from my sores.

Two or three people, who recognised me in that fearful condition, immediately gave me a cloak and brought me a little water. When I recovered my senses, I began to feel new sufferings, thinking of the affecting loss of my friends in the city, and the melancholy objects around me; people wounded, other lamenting the death of their relations; others having before them their dying children taken from under the ruins; so that it was impossible to give any adequate idea of my feelings. I spent the whole night in prayer and anxiety. Early the next morning I was conveyed to the nearest garden, to profit by the shade of the trees. I did not remain long before the French dragoman joined me, and gave me the agreeable news that all the European Christians, excepting a little boy, had been saved, but many, like myself were greatly bruised.

I remained four days without being able to move, owing to my bruises and sores, having only a sheet to screen me from the scorching rays of the sun. I then began to walk again, but with great pain."



THE LIFE BRIGADE.



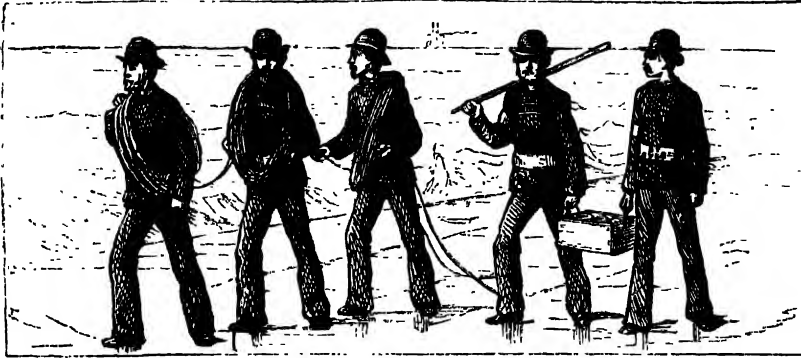
OLUNTEER associations for war-like purposes abound in these days, and it is pleasant to hear of similar organizations for the salvation of life instead of its destruction. Of this beneficent order is the Volunteer Life Brigade, of which a strong corps exists at Sunderland-on-the-Wear. Originally founded

by the exertions of Captain Coulson, an old resident in that busy and prosperous seaport town, the Life Brigade has expanded until it has become a most important and efficient aid in the preservation of life. Its object is as noble as it is simple. The members band themselves together to assist in the rescue of crews shipwrecked in the neighbourhood of the port. For this pur-

pose they are supplied with the requisite apparatus by the Board of Trade; and, by regular monthly drills, the members have become very efficient.

As will be seen, the method adopted by the Brigade for making a communication with a stranded ship is the rocket system. A tripod is erected on the ground, under

which is suspended a stout hawser, the means depended upon to bring the shipwrecked men to the shore. From under this tripod a rocket is fired, which, on its course, carries with it a line, by which the hawser is drawn to the wreck. Should the rocket be skilfully fired, and the line reach the ship, the crew draw the hawser on

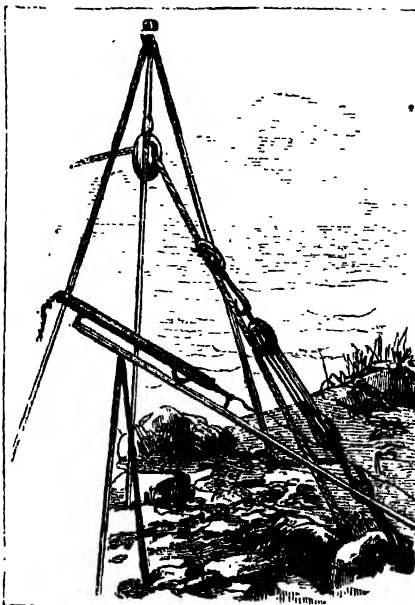


board and attach it, as sailors know so well how, to some suitable portion of the wreck. On this hawser, in a manner which will be rendered perfectly plain by a glance at the picture, is suspended the "breeches buoy," on the proper action of which depends the life or death of the shipwrecked sailors. This is drawn along the hawser to the shore, by means of the "whip," or side line. The shore end of the hawser is of course to be attached to a rock or some other firm object.

It is obvious that in such a proceeding the saving of every moment is a most important element. A twisted or "kinked" line, a badly adjusted hawser, or dirty gear, and human life would pay the penalty. Accordingly, a system of drill has been established, most minute in its regulations, but admirably adapted to secure its object. Upon

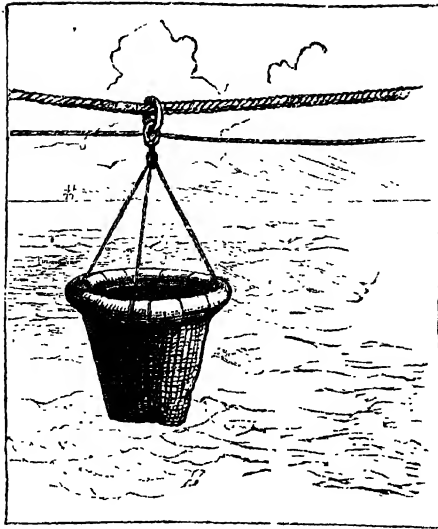
the approach of a storm or thick, dangerous weather upon the coast the gear and small stores are mustered and put in order, the cart examined, the lamps trimmed, and general preparations made for service. A sharp look-out is meanwhile kept seawards.

A wreck is at last announced, and great is the activity amongst the members of the Life Brigade. At the word of command the party run swiftly, but with military precision, to some convenient spot opposite the scene of the wreck. All the party are numbered, and each has his respective duty assigned to him. Thus No. 1, to whom the important task of firing the rocket is entrusted, deftly places the rocket frame, attaches the line, and applies the port-fire to the fuse. The others meanwhile, each in his own sphere, render as-



sistance. Nos. 2 and 3, for instance, attend to the lines, and take charge of the "whip," which is to draw the stranded men on shore. To Nos. 5 and 6 is confided the charge of the hawser. No. 7 attends to signals, under the direction of the officer. No. 8 takes charge of the life-belts, and looks after the rescued men when landed. The remaining "numbers" are all this time busy in various ways. The "auxiliaries" assist in carrying the stores from the cart to the point of action, or are told off to keep the ground clear of the crowd.

In our large illustration is represented one of the drills. The "breeches buoy" is



here seen in successful operation. The south pier for the nonce was taken to represent a wreck; and the five companies composing the brigade, to the number of seventy men, mustered on the north pier, where the rocket apparatus was fixed. The

time taken to perform the various manoeuvres, to "rescue" the man from the south pier, and to land him safely amongst his rejoicing comrades on the other side of the gulf, was only seven minutes and forty seconds—the quickest time for rocket apparatus practice on record.

It would seem almost inconceivable that the whole of the evolutions should be

gone through in that short space of time, so many and so various are the duties. It is, however, but an example of what can be effected by the combination of strong arms and willing hearts.

It is to be hoped that the example of Sunderland in establishing a Volunteer

Life Brigade will be followed in other seaports. Extensive as are the operations of the National Life-boat Institution, and widely as the Coast-guard, with its various means of saving life, are distributed round our coasts, there is yet room for many such life brigades.



A MYSTERIOUS COLLISION.



was a lovely day early in the month of February, and the ship was bowling along "close hauled," with a splendid breeze.

We were nearing the line, and had lost the north-east monsoon, which blows with varying force all the year round north of the equator, and were fortunate in having fallen in with a good steady south-easterly wind, that promised to last some time, and carry us perhaps into southern latitudes; for we had experienced a long run of bad weather in the "chops of the Channel." The winter had been unusually severe, and the gales during the months of November and December very frequent. After a great deal of knocking about we felt the more pleased with the change. As I was saying, there was a fine spanking breeze—what is called by sailors a "topgallant breeze;" that is, when a ship can just carry well her topgallant sails. The beautiful morning had given place to as beautiful an afternoon; the sea was smooth, with a long swell; and the dancing waves, with their crests just ruffled by the wind and tipped with foam, came tumbling one over the other in a joyous way, as if running a race to meet the ship; but, on encountering the opposition of the bows, these "white horses" speedily succumbed, and, after an angry buffet against the stern, disappeared in the black depths under her bilge.

The *Amphitrite* was a new ship, marked A 1 at Lloyd's, of 1800 tons burden, and this was her first voyage; she was clipper-built, and the fastest vessel I ever sailed in. We never looked out for ships astern, but, whenever a sail was sighted, it was always ahead, and before night fell we were certain to leave her hopelessly behind. Many a storm and gale have I experienced on

board her, and right nobly she always behaved in them, riding over the waves in spite of the immense weight aloft of the heaviest and squarest spars ever fitted to a ship of her size. Once in a hurricane, when we were lying to quite snugly, a large China trader went down before our eyes.

On the 10th of February, the day of which I am writing, the *Amphitrite* was sailing with her yards "braced sharp up" on the port tack, and every stitch of canvas was drawing, she having all "plain sail" set. The passengers (myself among the number) were all standing on the poop, talking and joking, and looking forward to doing justice to a good dinner, for which this pleasant sea breeze gave us an appetite. On a long sea-voyage dinner is the great event of the day, to which every one looks forward as breaking the tedious monotony in an agreeable manner. The heat of the day had been great, although tempered by a double awning spread over the poop, under which we had placed our easy-chairs, and, with our books in our hands as a make-believe, we enjoyed the sweets of the *dolce far niente*. Conversation naturally turned on crossing the Line and its attendant ceremonies, which were pretty generally spoken of as follies, especially by some young cadets going out to join the army, who were looking forward, half with feelings of curiosity and half of dread, to the advent of Neptune with his motley crew and bucket of slush. Of all senseless customs and traditions, this Line folly is about the most unreasonable. There can be no harm in the sailors' dressing up and blundering through a performance, but the manner in which passengers are often ill-used is monstrous. This nuisance is now considerably abated, and it is hoped will soon entirely cease to disgrace the mercantile marine. Few respectable merchant-captains allow their passengers to be thus insulted. The practical joking is frequently

used as a means of extorting money from timid people, who would pay anything rather than be subjected to ill-treatment.

Three or four of the cadets had expressed their determination to join together for the purpose of resisting any attempt to make merry at their expense, when suddenly the look-out man on the foreyard sang out, "Sail ho!"

"Where away?" was the query from the officer of the watch on the quarter-deck.

"On the port bow," was the rejoinder.

The mate then asked what he made her out to be; and the reply was that she looked like a full-rigged ship, but as she was coming down before the wind, he could not make out for certain what her rig was. The captain, being informed of this, soon came upon deck, with his long glass, and tried to find her. We, all of us who possessed telescopes, went on the fore-castle, and swept the horizon forward, but could see nothing; but this was to be accounted for from the fact of her not having yet appeared above the horizon. However, in a few minutes we made the white sail out, like a speck in the far distance.

The breeze was freshening, and soon we were gratified by a nearer inspection of the stranger. We found that she was a square-rigged ship, with all sail set, royals and studding sails below and aloft and on both sides.

"She walked the waters like a thing of life," and came down before the wind like a race-horse, with the foam curling away from her bows. There are few more beautiful sights than a fine ship heeling over under full sail, with the copper on her weather-side showing, and every stitch of canvas belying out to catch the favouring breeze. The ladies were admiring her beautiful proportions, and the fine effect of the setting sun as it lit up her sails and glistened along her sides, painted black, but relieved with white ports.

All hands now crowded up as the word was passed that the strange ship wished to speak; for she appeared as steering to intercept us. Nearer she came and nearer; and, now that we could see her so well, the

passengers retired to the poop, there to be out of the way, and the better to hear all that was said. The captain sent his boy down to his cabin for the speaking-trumpet, and we began speculating as to her nationality, for we could not see any flag flying. Some of the young cadets, having probably more money than they knew what to do with, began laying bets as to whether she was English or Swedish; for the quarter-master, an old salt, said she was a Swedish-built ship. To induce her to show her colours, we hoisted the ensign, and then eagerly watched for the response. But no "bit of bunting" fluttered up to her mizen peak; and one of our number, the doctor, who was rather romantically inclined, conjectured she might be a "rover free."

The wind was now blowing freshly; but the ship still carried her royals and studding sails, and still came bearing down on us. We altered our course a point, just to see whether she really did wish to speak, and the stranger appeared to follow suit. This seemed to decide the captain as to the ship's intention of communicating with us, but yet she persisted in not showing her colours—a most unusual thing on the high seas, where common courtesy dictates an exchange of flags; and, what was still more strange, we could see no indication of life on her decks, for there were no heads peeping above the bulwark or the rail of her fore-castle. The look-out man, who had a bird's-eye view of her, on being hailed, said he could see no one on board.

There is a "law of the road" at sea, as there is on shore among drivers of vehicles; and it is this: ships on the port tack, sailing near the wind, give way to vessels on the starboard; and ships running before the wind yield the pride of place to any they may encounter close-hauled on either tack. Now, we being "full and by," that is, close-hauled, it was the duty of the stranger, in case of an accident, and to avoid a collision, to put her helm a-port and get out of our way. I mention this to exculpate us from all blame as to what followed. We, not expecting anything, but

being still under the impression that she had something to communicate, kept on our course; but it soon became evident that her captain intended passing almost too near us for safety. If he had his ship well in hand, however, he might with ease prevent any disaster arising from our proximity. Some dark clouds were rising up, the wind blew now strong and in gusts, and we could not imagine how the other skipper could be so insane as to keep his topgallant studding sails set.

Being soon within hailing distance, our captain raised the speaking-trumpet to his mouth, and shouted out, in a stentorian voice, "Ship ahoy! What ship's that?" No answer. "Ship ahoy!" again rang over the waters. Still no reply to the summons.

"What does this mean?" said the captain to the first mate and a knot of passengers, myself among the number, standing by him on the break of the poop. We all looked at one another, and then at the ship anxiously. What indeed could be intended by this silence? Was it a ruse to carry out some diabolical purpose? It was dusk, and stories that I had read, when at school, of the *Flying Dutchman* and other old sea-legends, involuntarily recurred to me and raced unbidden through my brain. Not a soul could be seen on her decks, which were now distinctly visible. "Ship ahoy!" for the third time Captain Harvey bellowed out, and then ran off the poop on to the quarter-deck; for it was now awfully certain there must be a collision.

"Put the helm hard up!" he shouted out to the quartermaster as he descended the ladder; but it was too late.

I saw how it was to be, and caught hold of the cross-jack lists to steady myself. Like lightning the huge mass of wood and tall spars and towering canvas struck us full on the port bow, a blow that caused every timber and plank in the vessel to creak and groan with the concussion. So terrific was the shock that our ship seemed absolutely to stand still as if aghast; the masts and yards shook and reeled like a forest of trees when blown by the passing

gale; and the sails for an instant were thrown flat aback, in spite of the fresh breeze that was bellying them out and stretching the canvas to its utmost tension.

I saw that several of the crew and passengers were thrown down; and, as is usual on such occasions, the ladies fainted right and left. Some only wrung their hands, and screamed in an agony of terror; but the gentlemen hurried them all down indiscriminately into the cuddy—not a very safe place, certainly, if we were going to founder; but there was confusion enough on deck without its being "worse confounded" by the persons of insensible ladies, young and old.

When the ship struck us on the port bow her bowsprit was right over our decks. At the last moment, when it was too late to be of much service, our helm had been put "hard up," thereby paying the *Amphitrite's* head off. Instead, therefore, of the stranger steering alongside of us, she carried on her way, with her huge bower anchor, the flukes of which were hanging over the side, tearing all along our bulwarks, carrying away "dead-eyes" and "lanyards," and laying the ship's side open. Up aloft matters were much worse; for the yards, and studding-sail booms, and all the gear were caught in inextricable confusion, and came rattling about our ears; most of the spars, fortunately for the safety of those below, falling overboard. The noise of the creaking timber and tumbling booms and yards was terrific. Nothing could be done; for the two ships had each great way on them, and it was evident they would soon clear each other, even if all the masts were to go "by the board" in the struggle. Three of our men were seriously injured by the falling *débris*, and had to be carried below; one poor fellow with both legs broken.

In the meantime, how had our opponent fared through all this business? One of her studding-sail yards fell on, the poop with its sail, and the spar, falling "end on," dashed a hole through the deck, nearly knocking my brains out at the same time. Her foretopmast went like a reed, carrying

with it the maintop-gallant mast and the jibboom ; but all this luckily fell clear of us into the water. The most singular thing of all, however, was the fact that not a soul could be seen anywhere on board her—neither on the look-out, nor on the decks, nor on the poop ; and, what was incomprehensible, there was no one at the wheel. She seemed like a ship of the dead. Had we chosen, we could have jumped on board her with ease as, in her mad career, she tore along our whole length, from the "cathead" to the "boomkin," where was fitted the "pennant" of the main brace, and which, as a parting salute, she broke short off like a carrot. Everybody seemed for the moment paralyzed, and took shelter until the storm of falling wreck and blocks had subsided.

The stranger presently dropped astern, after having done us all this mischief ; and we could then see that she was a large ship of about 1000 tons burden, of English build, and deeply laden. She looked a perfect wreck, with her rigging all hanging about, and her "top hamper" trailing in the water, mixed up with gear and sails. All this happened in much less time than I take to narrate it, and in a few seconds a fine ship was reduced to this pitiable condition. However, our thoughts were chiefly centred on our own safety ; and the first thing to discover was whether we were in a sinking state or no. The captain immediately ordered the carpenter to sound the well. On doing so he reported that there were eight inches of water ; and, as this was only an addition of two inches above the usual amount, we were much relieved. A party was told off to the pumps, and all watched with anxiety to see whether the water gained on us. The boatswain piped "Hands clear wreck !" and up aloft, streamed the topmen to send down the stumps of the shattered masts and clear the tangled ropes.

It was fast getting dark, and now that our immediate safety was assured, we turned our thoughts to the stranger. When she first sheered off us all her sails were flat

aback, and she was evidently without guidance, and just "forging" ahead slowly through the water ; but she soon fell off before the wind, and ploughed along her watery way as before.

We could see the ship a long way astern, and, as we passengers were talking and discussing the collision, suddenly one of our number exclaimed, "Hullo ! I can't make her out now." We looked, and she was gone. The spot she occupied a moment before was vacant. We strained our eyes, but in vain ; nothing could we see but the rising waves, and the clouds overhead now threatening an approaching gale. We went to the captain, and informed him of the sudden disappearance of the strange ship ; but he answered he had quite enough on his hands to occupy himself and all his crew, without lowering a boat and sending her, he did not know how far astern, on such a Quixotic errand. He said it was getting dark, and looked like bad weather ahead, and he must make all snug aloft before the gale came on. Besides, said he, to put an end to our remonstrances, it must have been all a mistake ; it was so dusk that we had lost sight of her position ; and she was probably all right, and we, no doubt, all wrong in our conjectures as to her having foundered. It was of no use arguing with him. We were firmly convinced that the unfortunate ship had gone down, as all of us were looking in her direction and saw her distinctly only a few seconds before her disappearance. The quartermaster on duty, whose attention was in no way taken up with the refitting of the wreck, afterwards corroborated our statements and ideas as to the end of the unlucky vessel. He expressed no opinion then, for he did not feel himself called to express a different view of the question from the captain. Every one agreed that there was not a creature on the decks anywhere when the two ships were in collision, with one exception, and that was the above-mentioned petty officer, who declared that he saw, just before she dropped so far astern as to render her wheel invisible, a man running

up on deck from below to the after-part. If this were so, it would account for her sails filling again.

The whole affair was shrouded in mystery, and we never discovered anything about her. To this day I know not what was her name, her country, or whither she was bound, and probably never shall. When we arrived in the East Indies, two months after this affair, the captain made no inquiries respecting the fate of the ship, and, I subsequently discovered, forbade his officers speaking about her to any one ashore or afloat. He could not stop our tongues, however, and for a long time this strange occurrence was the fruitful source of conversation. After the first shock, the imaginative young ladies launched out into all manner of romantic notions with respect to her. There was much ground for speculation and discussion, although we could learn nothing fresh thereby. Had the ship, having sprung a leak, been deserted by the crew while becalmed on the Line, and then the unfortunate seamen, considering they had no time "to shorten sail," abandoned her with all sail

set? and had a breeze subsequently sprung up and driven her in wild, unguided career over the trackless sea, until she fell athwart our hawse and so met her destruction? Was it so? or had the crew risen in mutiny against the captain and officers, and, after binding or murdering them, abandoned themselves down between decks to drunken dissipation, and, revelling in unwonted freedom from control, left the ship to take care of herself? If what the quartermaster stated he saw really took place, the last was the more probable supposition. But whether this was the case, or whether the fresh water had given out and the ship's company had taken to the boats, as I have stated, we never discovered.

The captain was right as to the weather; for it soon came on to blow a gale of wind, and we were under double-reefed topsails before midnight. Although much strained, the *Amphitrite* made little water, and we repaired our damages aloft, and were soon all right again.

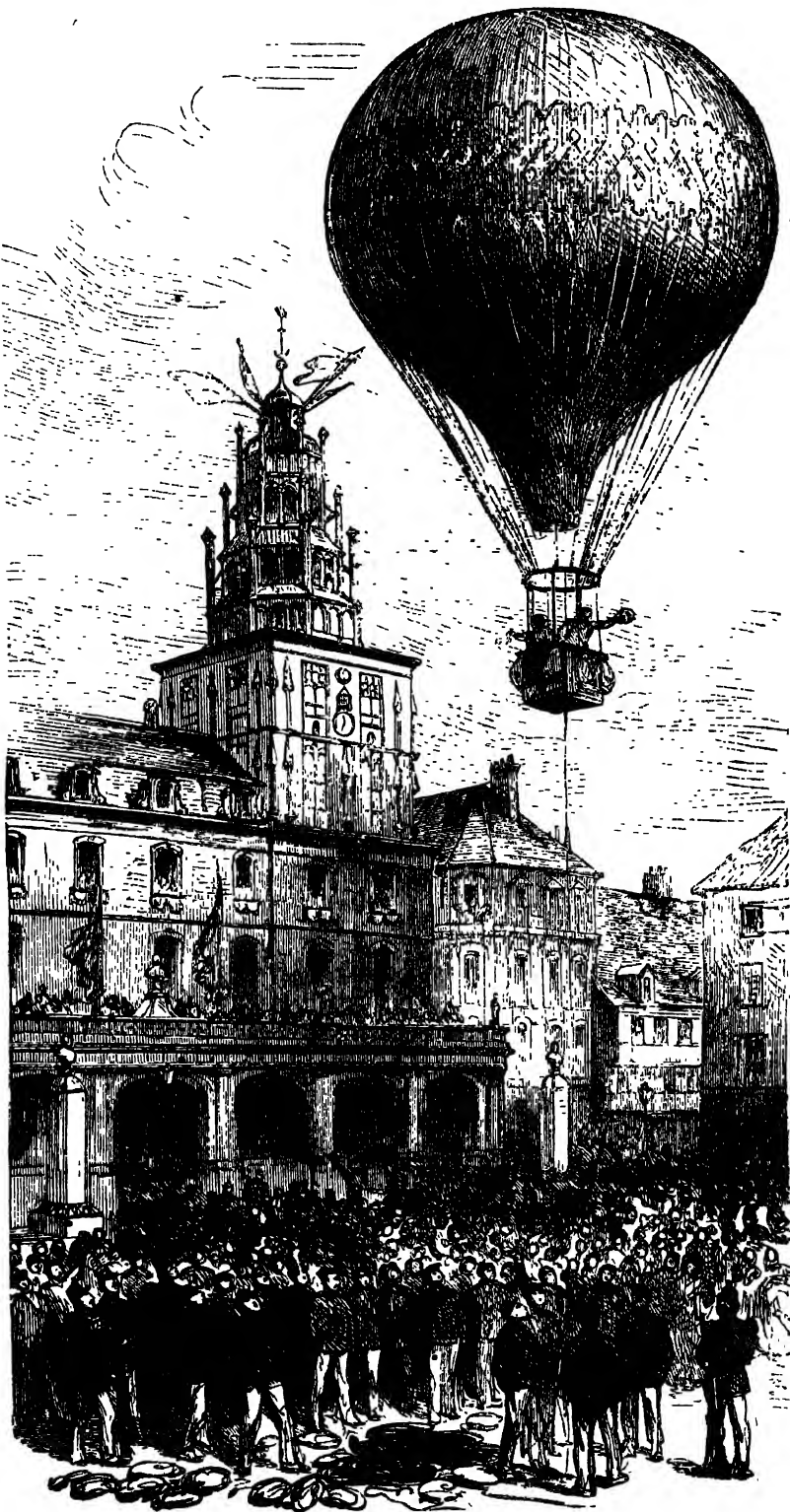
On arriving in port the ship had her "topsides" looked to and repaired, and all signs of the "collision at sea" were effaced.



A BALLOON CHASE AT SEA.

ONE of the most perilous balloon voyages ever made was that of M. Duruof and his wife from Calais, in September, 1874. Several fruitless attempts had been made, till at length the people of Calais became so disappointed at the postponement of the ascent that they jeered Duruof, and taunted him with cowardice. After bearing this for some time, Duruof decided to go up, and accordingly, after much protestation from his friends, he got away, the balloon leaving Calais, and going for a short distance northward,

and thence right out to sea. Night came on, and the aeronauts, who were but thinly clad and had no provisions, suffered terribly from cold and thirst. They drifted about the whole night, and when daylight came they found they were over the North Sea, and M. Duruof, not knowing how far he was from land, manœuvred to descend in order to get picked up by some vessel. They had been ten hours in the air, and were now doomed to be dragged two hours through the water, for though they were seen and chased by a fishing smack, it was quite that time before they were overtaken. The balloon, dragging with the car half under water, was every



THE START FROM CALAIS.

moment in danger of bursting, as the heavy seas broke over it, but at last the gallant captain and mate of the *Grand Charge* came up, and managed with great difficulty to get them into the boat. The balloon went off at a great speed towards Norway, and the half-dead aeronauts were taken on board the *Grand Charge*, where they were carefully nursed and tended. As soon as the smack reached Grimsby, the news of the rescue was quickly spread by telegraph. Whatever one may think of the rash conduct of M. and Madame Duruof in risking their lives upon such a purposeless excursion, there can be but one opinion respecting the behaviour of the gallant English sailors, William Oxley and James Buscome, who at the risk of their own lives rescued them from a watery grave.

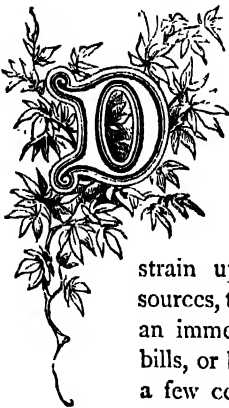
It is said that, in 1804, a Spanish nobleman, accompanied by two friends, went up from Boulogne and was cast away in the Adriatic, being even less fortunate than Duruof, as the first vessels which

sighted the balloon fled in terror at the strange monster. He was, however, ultimately saved. In 1846 a Frenchman went up from Trieste on the ring of a balloon, the car being cut away as too heavy; he was also picked up in the Adriatic. The late General Money once ascended from Norwich, volunteering to supply the place of an aeronaut who had turned coward. Not understanding the working of the valve, he cut a slit in the balloon with his sword in order to descend, and came down at sea, off Yarmouth, where he remained all night, and was discovered by a fishing-boat next morning. The fact of a Dutch vessel passing close to him without offering any aid, aroused much indignation, and the following lines, written *apropos* of the occurrence, became very popular:—

Beneath the sun there's nothing that's new,
Though Solomon says it, the maxim's not true;
A Dutchman, for instance, was heretofore known
On lucre intent and on lucre alone:
Mynheer's now grown honest, retreats from his prey,
Won't pick up even Money that drops in his way.

HOW TO MAKE MONEY.

AMERICAN BANK-NOTES.



DURING the great war in the United States, the gold and silver, and even the copper coinage, were very scarce. To meet the strain upon the national resources, the Government issued an immense amount of paper bills, or bank-notes, each from a few cents to several dollars in nominal value.

There are several large companies in New York who thus manufacture money, not only for the United States, but also for the South American Republics, for Japan, and for several European Governments.

In addition to the bank-notes and bonds, there are other forms of paper money, such as postage-stamps and internal revenue stamps of various kinds, and of all values, from one cent (a halfpenny) upwards. The National Bank-note Company, which prints all the postage-stamps for the United States, prints 500,000,000 in a year, and sometimes sends off as many as 13,000,000 in a single day—a large wagon-load! Compared with the English, many of the American bank-notes are elaborate works of art, giving little vignettes of landscapes, historical scenes, portraits, etc., all engraved with the utmost minuteness, and beautifully printed on specially-made paper. This paper, on which all the money of the

United States is printed, is made only at one mill near Philadelphia, and it is a penal offence for any one else to make it. By means of an automatic machine a register is kept of every sheet made, and for which the mill proprietors have to account.

The first safeguard in the printing operations against counterfeiting is the portrait. There are no artists in their profession superior to those who are employed in the designing and engraving of bank-notes. By the side of these genuine artists the counterfeiters are blunderers. In a good bill the portrait is always an accurate likeness. To secure it, a daguerreotype is first obtained. This gives a picture on a metallic plate. The features are then drawn lightly on the plate with a sharp-pointed instrument by an artist, who follows accurately the outlines of the portrait. From this outline an impression is printed. The operation of printing from what is little more than the scratch of a pin is a delicate one, as may be well imagined. The impression thus obtained is transferred by a chemical process to a steel-plate, which is covered with a preparation of wax, the better to receive the impression. The artist then has before him a steel-plate covered with wax, on which the outlines of the portrait which he is to engrave have been mechanically transferred from the sun's own painting. These outlines are then traced on the steel beneath by a sharp tool; the wax is removed, and the face is still presented in outline on the steel. The shading is then completed by the workman, who, to accomplish his task successfully, must possess at once the artistic skill of a draughtsman and the patient mechanical skill of a perfect engraver.

This work of engraving is one which requires the utmost accuracy of eye and steadiness of touch, and very diverse kinds of skill. One artist has success with portraits, another with buildings, a third with lettering in fine ornamental characters. No one artist ever engraves an entire note ;

several different artists are always employed on each bill. The processes by which their various operations are combined in one constitute, perhaps, the most curious and interesting of all the various operations in the manufacture of paper currency.

The process of making the steel-plates is as follows : After the design of a bank-note is fixed upon, it is given out in separate pieces to separate artists. There lies before us, as we write, a two-dollar treasury-note ; on it is a portrait of Jefferson, a picture of the Capitol at Washington, the printed lettering, "United States will pay to bearer two dollars," the signatures, the large figure 2 in one corner, and a great quantity of twos printed in very fine lettering all around the margin of this note, and an elaborate ornamentation in various parts of the bill. One man probably engraved the portrait of Jefferson on one piece of steel ; another, working at a separate desk, engraved, on a separate piece of steel, the printed letters ; a third the signatures ; others the view of the Capitol building ; and still others engraved the small letters on its margin ; while still another probably engraved the large figure 2, and one or two more did the ornamental work. Each of these bits of pictures and lettering was engraved, the reader will understand, on a separate piece of steel. Sometimes as many as thirty steel-plates are combined in a single note. It is the process by which this combination is effected that is so extraordinary.

The reader must not imagine steel to be necessarily a hard piece of metal. Hard and soft are but relative terms, and the steel of the engraver is made hard or soft, according to his desire. Steel rollers are prepared. They are softer than the steel-plates on which the separate fragments of the bank-note lines are engraved by the separate artists. By a powerful pressure the various pictures which the artists have engraved are impressed on these steel rollers. The work of the artist is, of course, reversed, and the picture, or rather the fragment of the picture, appears on the

roller in a legible form, as it will subsequently appear on the note.

The artist now has his bank-note on separate rollers instead of on flat plates. These rollers are now hardened by the action of fire, and thus prepared for the transferring machine. In this machine a flat plate of soft steel is placed, the roller containing some fragment; the portrait, for example, is adjusted by the workman in its proper place over and upon the steel-plate, and a pressure of from fifteen to twenty tons is brought to bear upon it. This pressure transfers the portrait to the steel-plate below. The roller is then taken out, and the next roller put in its place. This is adjusted so as to bring it in its proper place, and the pressure is again applied. The roller itself is moved gently back and forth by the hand of the operator, so as to distribute the pressure equally on all parts of the picture. Thus one roller after another is introduced, the operator depending on his skill of eye and hand to adjust perfectly the various fragments of the complete design to each other until the whole bank-note is impressed upon the soft steel-plate. The utmost skill and accuracy are required in this operation. The most powerful magnifying-glass brought to bear upon the bank-bill fails to show where the various parts of the completed picture have been joined.

This plate is now to be prepared for the press by being hardened. For this purpose it is taken to the furnace and there immersed in a fire-proof box containing carbon, and plunged into the furnace. When the requisite heat has been obtained, it is taken out and dipped quickly into oil or brine, or transferred to a vice, which screws its surface hard upon a plate of lead, where it is left to cool. This operation is one requiring great judgment and dexterity. The heat must be of just the required amount, neither too much nor too little, and when the heated plate is ready to be taken from the fire, it must be transferred so instantly from the carbon-box to the

plate of lead or liquid that the air shall have no opportunity to perceptibly cool its surface. This annealing being completed, the plate is ready for the printer.

We ought not to pass the engraver's operations by without mentioning the geometric lathe. The reader will observe on many of the bank-notes a series of very intricate and involved lines, running to and fro in involutions which defy imitation. In the bank-note before us, as we write, the figure 2 is printed on a background formed by these snaky lines. This is done by means of the geometric lathe—an instrument which, by a singular combination of wheels, can be set to marking out almost any conceivable combination of curved lines. The number of combinations is practically without limit. The machine is an expensive one, and can only be made by machinery; the counterfeiters are not able to imitate successfully its work. To the casual observer the portrait is the best test of a counterfeit bill; to the detective the lathe work under a magnifying-glass affords the final test.

We have left but a word to speak of the printing process. Two persons work the press together. The first inks the plate, and so prepares it for the press, adjusts it in its place, and by a turn of the wheel applies the pressure; a second cleans the plate off, and prepares it for a second printing. This is done, first by wiping off the remaining ink with a cloth, and then polishing the plate with whiting, rubbed on with the palm of the hand. Long experience has demonstrated that there is no such polisher as the human hand; but it gets dreadfully dirty in the operation. A register is connected with every machine, which thus records every impression taken. This register is locked, and the key is in the possession of the superintendent, who thus has a means of proving that no money has been abstracted from the printing-room. In the printing-room at the Treasury Department eighty of these presses are in simultaneous operation; in one of the printing-rooms of the National Bank-note

Company of New York there were one hundred and sixteen. The men are paid by the piece, and work with marvellous rapidity, and the room presents a very striking picture of busy activity. It can hardly be credited, but it is the fact, that the wiping of the plate by the hand sensibly wears away the steel, and the difference in value of different workmen is measured by the skill with which they succeed in polishing the surface with the least wear—producing the greatest cleanliness and the least attrition of the plate.

The money is now substantially ready for the market. It only remains to print upon it the seal of the United States—a red stamp; to add the number, which is changed with every printing by an ingenious contrivance, giving to every note its

own number, and finally to divide the notes, which are printed six or eight on a single sheet. The money is then packed in boxes, and stowed away in vaults, ready for use.

The most wonderful thing concerning these operations remains to be told—the accuracy with which they are conducted. A single sentence from the report of the chief of the department sums up the results of this painstaking care :

“It affords me great pleasure to state that, in the engraving, printing, and finishing, of 890,483,995 dollars, notes, bonds, and other securities, and 104,140,286 stamps, during the year (1871), not one note or sheet of paper, or any portion of a note or sheet of paper, has been lost to the Government.”

THE CRYSTAL GROTTO.



ZEALOUS must be the travellers who visit the Balearic Islands, on the east coast of Spain. Indeed, few English people ever hear of or think about them. Yet they contain much that is beautiful. They have magnificent mountains, fine towns, splendid gardens, and an active, intelligent people ; but they are all shrouded in

Popish darkness, and this is one reason why we hear so little about them.

At one time these islands formed a kingdom called Mallorca, comprising the five islands, Majorca, Minorca, Iviza, Formentera, and Cabrera, but they now belong to Spain. The soil is fruitful—vines, olives, figs, oranges, and other tropical fruits, flourish luxuriantly. The oil harvest is very considerable, averaging 700,000 gallons yearly. Saffron is also largely cultivated. Most of the people are

employed in agriculture, but they also make good woollen and linen cloths, and they are celebrated for their cabinet work and pottery ware.

A traveller who recently visited these islands thus describes what he saw :—

“We landed upon the island of Majorca. The capital is Palma, a very pretty town. The cathedral towers above the ramparts, and inside of it there is a wondrous scene of beauty and a wondrous mass of trash. The beauty is in the pillars, the windows, and the carving; the trash is in the relics of old bones and paintings. The grandest architecture may enshrine the most abject superstition.

We hired a horse and cart to make a tour of the island, which took us several days. The driver sat on a sheepskin, with his legs on each side of the horse's flanks. The strange dialect this man spoke made it very difficult to converse with him; but his excessive desire to hear of England, and England's religion, and England's laws,

seemed to force us to speak, and enable him to understand.

We stopped a night at Monaco, in the house of a worthy wine-presser, and the next morning started for a trip to the farthest end of the island to see the far-famed Cave of Arta, which is reputed to be the most splendid specimen of a crystal grotto in the world.

Three hours of smart walking brought us over a rocky country to the bold cliffs breasting the sea, where a cave's mouth yawns broadly in a mountain's side. We lighted some pine brands, and descended to the darkness. Sometimes the cavern is illuminated by Bengal lights. It is indeed a noble cavern. The floor is of rocks heaped over each other in wild confusion. The roof is like that of a cathedral, with a hundred aisles and ten thousand pillars. For more than three hours we wandered among lofty columns, glittering with crystals, drooping in graceful pendants, clustered in massive groups, arching here over endless ways of darkness, and encircling there the cool, bright waters of a quiet spring. Some of the pillars have hung for ages without any support from the ground; others are reared on high in peaks and points that are still too short to reach the lofty ceiling. Some are pink, or grey, or white, in colour, and far too many are blackened with the smoke from the pine-wood

torches. Others give solemn musical notes when struck, and the echo makes them sound like an organ. In one part, until lately, you had to be lowered into the depth by a rope, while you climb the steep sides to reach still farther caves in other directions."

And how has all this been formed? Has it been worked by generations of artists? Has it been hewn out by a sudden convulsion of nature? Was it created thus with the world itself, and called into being at once with all its million crystals? Not one of these. Like many of God's most wondrous works, it has been ages in finishing, and this grand mass of underground architecture has all been formed and beautified by little drops of water, singly adding each its particular atoms to the whole. The water oozes through the roof, and brings with it from the mountain above invisible particles of limestone. The little drop, like a bead of dew, lingers before its fall, and while it hesitates there is deposited above a small grain of crystal, and then the drop leaps down and deposits an other little crystal below. And thus millions of drops in thousands of years do each their allotted work, every one bringing the top and bottom of the pillar they form still nearer and nearer to each other, until the parts at last meet and bind together, and remain a lasting monument far more beautiful than the richest work of human art.



THE TEMPLE OF PHILÆ.

PHILÆ, an island which lies just above the first cataract of the Nile, was sacred to Osiris, the most important figure in the Egyptian mythological system. The island is covered with temples, but none of them are older than the era of the Ptolemies. The original edifices were destroyed by Persian iconoclasts, and very

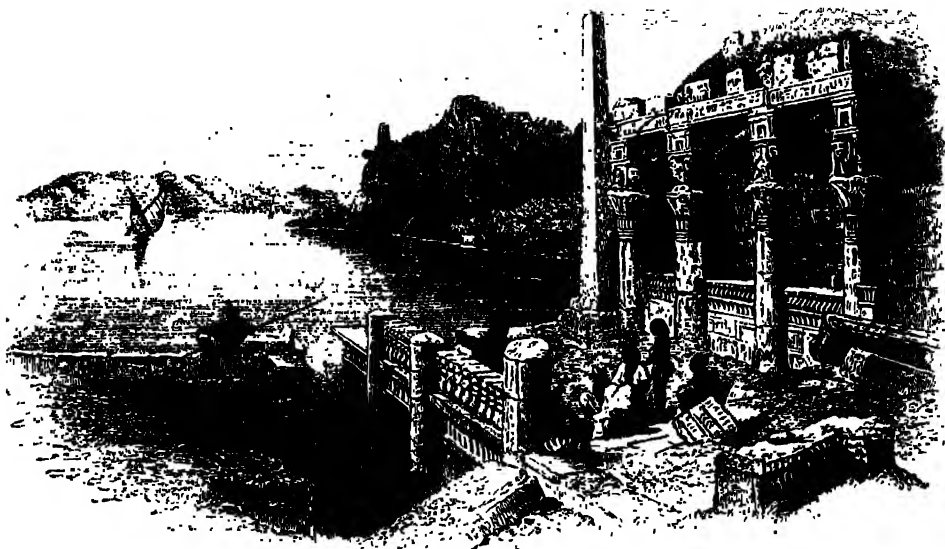
few traces of them can be discovered; it is difficult now to determine the general plan of the buildings.

The most conspicuous building on the island is an hypæthral hall, near the landing-place, vulgarly known as Pharaoh's Bed. It is detached from the main temple, and its builder and purpose are alike unknown. It can hardly have been a temple, and may possibly have been erected merely as an architectural feature. The most probable view is, that it was a comparatively modern

erection over the assumed grave of Osiris. Its situation is very striking, and it harmonises well with the surrounding scenery. Mr. Fairholt pronounces it "the most exquisite in its effect of any in Egypt."

The great temple of Isis was approached by a quay and a flight of steps leading up from the river at the southern end of the island. The visitor then passed between a pair of obelisks, of which only one is now standing, and along an avenue of Isis-headed columns to the great propylon. A peristyle court and a small temple sacred to Horus are then entered. Another smaller

propylon succeeds, and we reach the grand portico of the temple of Isis, its columns glowing with colour, their capitals delicately and exquisitely designed from lotus, acacia, and palm leaves. This general plan, however, fails to give any idea of the bewildering mazes of corridors, halls, and shrines, which succeed one another. Perhaps the most interesting portion of the building is a small chapel constructed upon the roof of one of the terraces. The sculptures in this chamber represent the history of Osiris. We see the mangled remains of the slain monarch brought together, women are



weeping round his bier, whilst the symbol of the soul hovers over the corpse. Gradually the signs of returning life are indicated. Winged figures, like the cherubim of Scripture, stand around overshadowing and guarding the body with their wings. The mystic legend unfolds itself step by step, till Osiris is seen robed, crowned, seated upon his throne, bearing in his hands, which are crossed upon his breast, the insignia of empire, and he is installed as the mighty and beneficent ruler of the invisible world.

On the downfall of the Egyptian mythology, Philæ became an important Christian colony. The monks who settled here, like those at Beni Hassan, defaced the symbols of the old faith and substituted those of Christianity. Some of these are very curious. We have not only the cross of the ordinary form, with the familiar addition of the palm branch of victory, or inclosed within a circle of amaranth symbolising eternity; but we find strange combinations of unusual forms with fanciful additions, of which it is difficult to discover the meaning.



HORSE-TAMING EXTRAORDINARY.

WE witnessed some years ago the taming of a magnificent Spanish steed, by an Indian horse-tamer belonging to the warlike tribe of the Comanches. The horse belonged to the Spanish minister to the Republic of —, and, having injured several grooms, and finally having destroyed the life of one the previous day, he was doomed to be shot, unless the Indian could subdue his hitherto untameable spirit.

A ring was measured and fenced with high barricades, behind which, at a respectful distance, were placed the seats of the spectators. These seats were thronged, and expectation was excited to the uttermost. At the time appointed, a slight, wiry Indian, in a hunting suit of hide, glided into the ring, and was followed by two grooms, leading the refractory steed. Bit, rider, and shoes, he had never submitted to, and on this occasion his halter had been exchanged for two iron "twitches" with long handles, the clasps confining each nostril. As he advanced, spurning the earth in his pride, there was a murmur of admiration. He stood seventeen hands high, his colour was coal black, his neck was arched and crested, his head tapered to a point, and his dilating eyes were flashing fire. The Indian advanced to within six yards of him, and signalled to the grooms to let go and retire. His Spanish owner remonstrated, and said it would be certain death; but the man persisted, and the grooms removed the twitches and vaulted precipitately over the barricades. The Indian stood with his arms folded, and the horse stood on the other side of the ring. He glanced once round the audience, and then, perceiving his supposed victim,

uttered a scream of rage, and rushed blindly, madly upon him. The man stepped lightly aside, and the discomfited horse struck the barrier with so much force that the spectators sprang up to the higher benches.

In a moment the horse collected himself for another spring; but the Indian fixed his eyes steadily on the infuriated animal, and slowly advanced towards him. The horse was now on his hind legs, squealing and snorting, but he did not advance one step. The Indian came nearer, and as he approached the horse settled into a quadruped position, and his rage changed into a look strongly resembling fear. The tamer was now within two feet of him, and in this position the man and the horse remained during a breathless silence of half an hour. At first he seemed restive under this steady gaze, and tossed his head and glanced uneasily around; but gradually the head began to droop, the tail, which had been lashed incessantly and furiously, hung motionless, the flanks began to quiver, and, finally, beads of foam stood upon the beautiful neck. The Indian now approached, still looking steadily, and laid his hands upon that head which none had ever approached without a muzzle or a twitch, except the groom who had been killed on the day before. He next took the head between his hands, and for several minutes breathed into the nostrils. During this process the horse became covered with sweat and foam, and trembled all over, so that it was no surprise when he followed his conqueror round the ring as gently as a favourite pony. A snaffle bridle and a saddle were brought, and he submitted quietly to both, and was not the least disconcerted when the tamer mounted him, and amidst rounds of applause rode him round the ring. Whatever the secret was, the conquest was complete; the horse was

shod the same day, and three weeks afterwards his owner rode him at a review.

This mode of taming horses is very commonly practised by the conjurors of the Indian tribes; and some years ago an Irishman of the name of Sullivan, known as "the Whisperer," pursued a plan which was supposed to be somewhat similar; but his operations, whatever they were, were conducted in solitude, and his secret died with him. To Mr. Rarey justly belongs the honour of having introduced into this country a system of subduing vicious horses, certain, humane, and safe, and equally far from jugglery and mystery. We trust that it will ultimately supersede all the clumsy tackling and needless cruelties of the horse-breaker; but we should hardly advise any one not possessed of strong nerves and unusual patience to attempt it as an amateur.

Some time ago Mr. Rarey explained and illustrated his system in the Birmingham Circus, to an audience evidently interested practically in horses. From a peculiarly knowing look, the cut of their coats, and their mode of walking, it was obvious that nine-tenths of the people present were versed in the mysteries of horsemanship. When Mr. Rarey entered, he was received with a burst of applause, a repetition of which demonstration he earnestly deprecated, as likely to affect the nerves of his pupils. This horse-tamer was far more like an English officer than a horse-breaker. He was a small, slight man, with good features, light hair and moustache, and a remarkably intellectual, gentlemanly expression of countenance. He was dressed in a dark morning suit, and his appearance and manner were equally superior. He began by describing the manner in which he had learned by experience the nature of the horse—a dear-bought experience, in which every bone had been broken except his right arm. He said that all the vice of the horse was learned from man, and that, if he were only treated properly, and indications of what he is to do made to his intellect, cleverly and gently, instead of hastily and

harshly, he would be the willing servant and the attached friend of man. He explained his process upon a quiet horse, and afterwards subdued two which were decidedly vicious.

The first horse was a beautiful, bright bay, nearly thorough-bred, with a small head and bright, timid eyes. He seemed alarmed at first, and restless; but a little fondling and a few quiet words reassured him, and he followed Mr. Rarey like a dog. After some explanatory remarks, Mr. Rarey showed his audience how to approach a horse, how to handle him, how to examine his feet, and, finally, how to mount him. He deprecated the use of powerful bits and curbs in general, as tending to rouse the spirit of resistance, and mentioned that the light snaffle is the only bit used in America. He severely criticised the way in which English gentlemen mount their horses, leaning heavily in the stirrup, grasping mane and saddle, and not infrequently pulling the latter almost round—a method of mounting, as he explained, very aggravating to the horse, and not always effectual till after two or three attempts have been made. He then removed the girths of the saddle, and, placing one foot in the stirrup, sprang lightly on the horse's back. He next stood in the stirrup, balancing himself over the saddle, and politely hinted that no man was a perfect equestrian who could not mount as gracefully, and then, dismounting, vaulted lightly into the saddle without the aid of stirrups at all, implying by his language that the stirrup was only an invention for old age. After going through the well-known process of strapping up the fore legs, throwing the horse down, beating a drum on his back, etc., which we were sorry to see tried upon the gentle thorough-bred, Mr. Rarey tamed an unbroken cart colt, evidently too sulky to turn out well, and neither spirited nor vicious enough to afford much interest to the spectators.

The crowning feature of the lecture was the introduction of a huge, powerful black dray-horse, eighteen hands high, which could never be shod, and could only be approached, when unmuzzled, by one man,

who always carried a short, stout stick. The expected advent of this animal created as much buzz and excitement as the entrance of a savage bull into the arena at Madrid, and sundry sounds heard during the previous half-hour had only quickened expectation. After a short interval Mr. Rarey entered the ring, looking as cool as if no contest awaited him, followed speedily by two grooms leading the equine monster, whose huge muzzle, heavy-cut bridle, and cruel bit, causing blood to drop from his mouth, added to the ferocity of his appearance. Mr. Rarey slowly stepped up to the animal and removed the muzzle, a kindness which he requited by making a savage plunge with intent to bite—an intent only frustrated by the agility of the American. Mr. Rarey then succeeded in getting close to the left shoulder, although the horse struck out most savagely with his fore legs, and, passing his right arm over the animal, by means of the bridle, dragged the head so much to the right as to secure himself from being bitten, and diminish the facility of striking out. In this position the horse, squealing, kicking, and plunging as much as he could, dragged Mr. Rarey ten times round the ring, and once so far succeeded in extricating himself as to make a desperate plunge at the barricades, which sent the occupants of the lower seats panic-stricken to the galleries. It seemed doubtful whether man or horse would conquer, when Mr. Rarey, taking advantage of a moment's pause, strapped up the hitherto unapproachable fore leg, and the infuriated horse, uttering a sound between bellowing and squealing, plunged round the ring on three legs.

Another strap was now passed round the pastern of the right leg, the end of which Mr. Rarey retained in his hand, and as the horse plunged, he was pulled down on his knees. The after-contest was most exciting, for the horse, rendered desperate, turned upon his fancied tormentor with his teeth, his only remaining weapons, and plunged upon him for nearly a quarter of an hour, so that it was only by great agility that he escaped being bitten, or crushed by the

animal's ponderous weight. Although the horse was on his knees, the hind legs were in their natural position, which gave him a most helpless appearance. At last science prevailed over brute force, and the horse, now nearly covered with foam, and very much exhausted, fell over on his side with a heavy groan, and lay stretched upon the straw.

His temper being apparently overcome, the heavy bit was replaced by a light snaffle, and he was caressed and fondled. Mr. Rarey then jumped backwards and forwards across him, and proceeded to stroke his hind legs. This roused the yet untamed spirit, and he struck out so savagely with his huge hoofs as to injure himself as well as alarm the audience. He raised himself on his knees, and made savage attempts to bite, but was again thrown down, and this time submitted to be stroked and have his hoofs rapped together. The fore legs were now unstrapped, and Mr. Rarey gave several sentences of his lecture while sitting on the horse's side. He was then allowed to rise; but as soon as Mr. Rarey attempted to mount him, he became very savage, and plunged several times round the ring as at first. The whole process was re-performed, and the second time with success; but Mr. Rarey vaulted on the horse's back simultaneously with his rise from the ground, and never attempted either to saddle him or beat the drum. It was so evident that he was exhausted rather than subjugated that Mr. Rarey informed the audience that three more lessons would be required for the purpose.

The cardinal points of Mr. Rarey's system are—first, never to let the horse know his strength; and, second, to make him man's friend by patient and gentle treatment; and, for his success in improving the condition of this faithful and noble servant of man, he richly deserves the medal presented to him by the Society for the Prevention of Cruelty to Animals. We trust that his system will be universally practised, and that the whips, spurs, Mameluke bits, head-straps, and surcingle, of the horse-breaker, with the rest of his barbarous apparatus, will be banished for ever.



WATERSPOUTS.

WE were bound, in a sailing vessel, for the West Indies, and reached the vicinity of that latitude which bears the name of the Tropic of Cancer. It would be difficult to conceive a more perfect calm. Not a cloud marred the soft even tone of the vast blue firmament, mellowed and enriched with a glowing tinge by the warm settled flood of light that perineated the arch above and around us; not a breath disturbed the unruffled surface of the deep: when suddenly the smooth surface of the waters was roused into action, and with our yards braced up we were again driving through the breaking billows with an adverse wind.

But it was not to last. A glowing gloom was now spreading itself around us, save only where, at intervals, the solar rays pierced through the rifts in the clouds. The sails collapsed and swelled alternately, flapping the masts. In the meantime the sea had changed its hue from a pure translucent blue to a greenish murky cast. Its crested and graceful undulations had also broken into a cross unequal action, as if in the throes of hopeless impotency. The sails hung heavily from the yards, while the brief, half-whispered remarks among the crew, who stood gazing around, imparted a livelier sense of the silence they disturbed. It was a solemn scene, and yet how beautiful!—beautiful, and, it might be, fearful. Above, below, around the circling expanse, all seemed spell-bound in a breathless pause. All was dark and murky, except to the eastward, where a long streak of the blue ether still appeared beneath a rugged arch, formed by the straggling edges of the wide-spreading vapours which had so suddenly conspired to shroud the face of heaven from our view.

But the central point of the gloomy mass, which had appeared settling immediately above our heads, had imperceptibly moved more to the westward, and now hung lower, with a bulging curve towards the waters, as if sustaining some ponderous weight, or, replete with the material of storm, was about to burst its bounds and scatter desolation around it.

“Stand by your topsail and top-gallant halliards! See your top-gallant sheets all clear there!” exclaimed the captain.

“All clear, sir!” was the brief reply; and the order and response alone disturbed the prevailing silence, and, for a moment, diverted fixed attention from the threatening point of attraction which was now palpably in motion. Still, no breath of air moved the sails, or raised a ripple upon the smooth dark waters, or even disturbed the light feathers that formed the dog-vane. Still, we gazed intently upon the moving mass—black, compact, and ponderous—that now within a hundred yards, in one vast convoluted heap, gravitated towards us, and threatened to eject its mighty burden into the sea beneath.

But look, look to the *eastward*! The arch has increased its span; its jagged edges are breaking and rolling into fantastic fragments, and in patches it is slowly scudding across the mottled area of the gloom above. Above, below, around the circling expanse, all now seems gliding into motion, and yet all is silent and breathless; and the gloom itself, as if rallying its strength, concentrates with an increasing intensity of blackness above and round the rolling mass upon which our glances instinctively settle. See, see! its curving outline is now protruding to a point below; now, like some monster’s limb, thrusting out the integument that conceals the mighty conflict within it. Look! the sea beneath is now agitated into a ripple; now rises

into a pointed hillock ; and now, jetting slowing upward, meets and interfuses with the descending vapour.

"Look sharp there, Mr. Tompion," vociferates the captain, "and have a gun ready !"

"Ay, ay, sir." See how the volume increases ! Upward, in a concentric body, now rush the whirling waters, while far around the base the eddying tide obeys the impulse, gurgling and rippling in its course. The vessel gently heels and rolls to the rising swell ; some secret influence appears to penetrate the deep, and suddenly to rouse its teeming inmates into sudden activity. Albicores and bonettas and dolphins, in wild confusion, appear and disappear in constant and quick succession ; yonder, with a whizzing and seething sound, a shoal of porpoises, like a herd of black swine, disport upon the waters ; and the dorsal fin and pointed tail of the prowling shark betrays with a long trailing ripple its discursive course. Above, below, around the circling expanse, all is now in motion : instinct with life, the waters ripple, gleam, and glitter.

"Be quick, there, with that gun, before the breeze takes us !" again shouts the captain ; "brace round the yards—let go your starboard braces—bowlines there forward—hurrah ! my lads,—away with the larboard braces—round with them !"

Upwards still the waters whirl from their base ; and now a thick connected pillar form, with the funnel-shaped volume of rolling clouds above, and with the lowering superincumbent mass, a mighty barrier seems to form in defiance of the advancing breeze. Onward it comes, with myriad billows dancing in its track ! Thicker and thicker the column expands ; around its gurgling pedestal the bosom of the waters heaves and undulates, and the vessel, heeling to and fro, is yielding to its treacherous indraught.

"All ready with the gun, sir !" exclaims a voice.

"Fire, then ; fire !" responds the captain. Bang goes the gun ; the welkin reverbe-

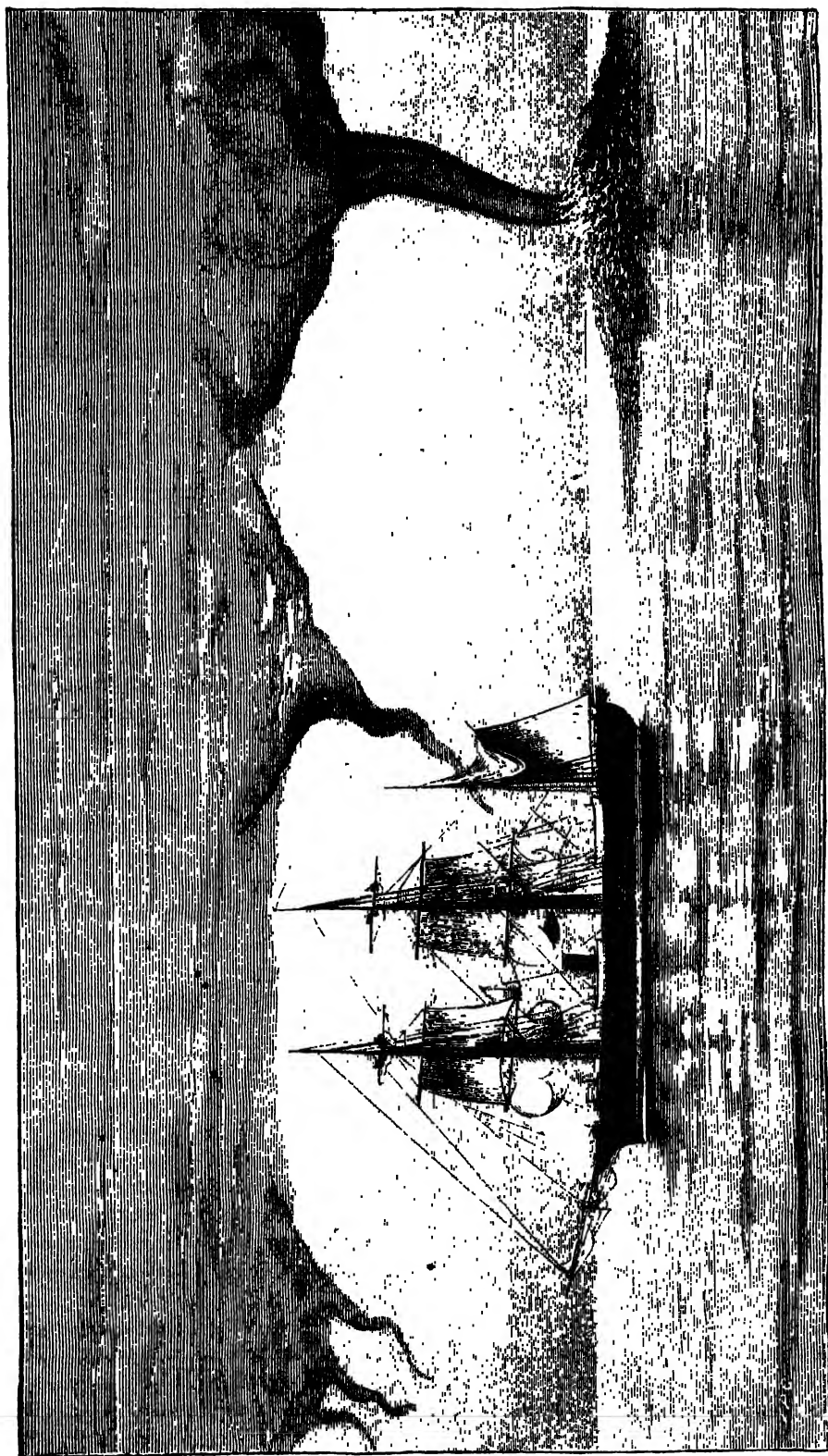
rates the report, and the rolling smoke in fantastic forms contrasts its whiteness with the impending gloom. The unwieldy mass trembles with the concussion ; the pillar, for a moment, leans obliquely, then breaks, and now down, down in one long precipitate heap the waters splash and whirl, and foam upon the sea beneath ; while far around, as through a vast sieve, in scattered streams they fall, drenching the sails and decks, and rousing the smooth surface of the deep into violent ebullition.

Havoc-stricken, the vaporous fabric rolls and breaks, and now the sun spears with his golden beams the severed fragments as they fly before the upper currents of the freshening breeze. Onward it comes ! How like the serried phalanx of a martial host, the dark blue waves with feathered crests advance !

"Stand by your top-gallant halliards—mind your weather helm, there !" See, see, it catches the topmost vanes ; now shakes the lighter sails. "Hard-up with the helm !" the captain cries ; and now, descending in its full career, the vessel heels, the billows break, and the noble vessel starts into buoyant life. Far, far away the vapours, now condensed, and melting into filmy haze, with scudding rain, are sweeping towards the west, whilst the refulgent sun,

"Not as in northern climes, obscurely bright,
But one unclouded blaze of living light,
O'er the wide deep his yellow beams he throws,
Gilds the blue wave that trembles as it glows."

Our picture represents one of Her Majesty's cruisers off the Gold Coast on the edge of a tornado, while on a passage from the Palmas to Cape Coast Castle. This coast, which usually enjoys fair weather, is occasionally visited by violent revolving storms, luckily of short duration, which are very dangerous. On this occasion several waterspouts formed around our vessel, the *Boxer*. The ship was under all plain sail, when the weather began to assume a threatening appearance, and waterspouts were seen forming in all directions, revolving and travelling at a high rate of speed. One or them appeared to be coming straight for



HER MAJESTY'S SHIP "BOXER" SURROUNDED BY WATERSPOUTS.

the ship. "Hands, shorten sail! Clear away the bow gun!" were the orders. In a very short time the little craft was under bare poles, and the gun ready with a blank charge; but the column took a sudden curve, the water at the base roaring in a very unpleasant manner, and was soon seen dissolving with the others, rendering the fire

of the bow gun unnecessary, a blank charge from which would have been sufficient to have broken any waterspout coming too close; but, happily, they all passed clear.

Then a perfect calm ensued; steam was soon got up, amidst a perfect deluge of rain, which lasted about an hour, and the little ship steamed away on her passage.



REMARKABLE CONFLAGRATIONS.

BEHOLD how great a matter a little fire kindleth." Witness the unextinguished embers left by many a camping-party in nature's wilds. Fanned by the breeze, and wafted a few yards to dry grass or stubble, a conflagration has been sent roaring over leagues of prairie ground, consuming miles of forest, driving the

wild animals away in terror, and the smoke of the country has gone up like the smoke of a furnace. The overheating of a baker's oven once set London in a blaze, and reduced half the metropolis to ashes, from the Tower to Temple Bar. This event, the Great Fire of our annals, occurred in the year after the Great Plague. It broke out early in the morning of Sunday, September 2, 1666, close to the present Monument, and raged for four days and four nights with unabated fury. Everything favoured the progress of the devouring element. The dwellings were generally of wood pitched on the outside; the roofs were thatched; the streets were narrow, the upper stories of the houses on opposite sides projected so as nearly to touch each other; the woodwork was dry and combustible, owing to the heat and drought of the preceding month; and at the same time the wind blew furiously from the east. Thus aided, the Fire King marched victori-

ously from east to west, and took possession of more than four hundred acres of ground. He made his meal of four hundred streets and lanes, thirteen thousand houses, eighty churches, besides chapels and public buildings, and gormandized over from ten to fifteen millions' worth of private property. His course was only arrested on the following Thursday, when the wind abated, and an immense gap was made by the blowing up of the buildings in the path of the flames.

There are several contemporary accounts of this terrible catastrophe, but none more real and striking than that by John Evelyn. "Oh," remarks he, "the miserable and calamitous spectacle! such as happily the world hath not seen since the foundation of it, nor can be outdone till the universal conflagration thereof. All the sky was of fiery aspect, like the top of a burning oven, and the light seen above forty miles round about. God grant mine eyes may never behold the like! The noise, crackling, and thunder of the impetuous flames, the shrieking of women, the hurry of people, the fall of towers, houses, and churches, was like a hideous storm, and the air all about was so hot and inflamed that at last one was not able to approach it, so that they were forced to stand still and let the flames burn on, which they did for near two miles in length and one in breadth. The clouds also of smoke were dismal, and reached upon computation near fifty miles in length. Thus I

left it this afternoon burning, a resemblance of Sodom, or the last day."

Though few lives were lost, yet the suffering was immense, from want of food and necessary exposure in the open fields. Evelyn tells us that he went "towards Islington and Highgate, where one might have seen 200,000 of all ranks and degrees dispersed and lying along by their heaps of what they had saved from the fire." But while a great immediate evil, an immense advantage was the final result, as better dwellings and broader streets took the place of the filthy dens and narrow lanes where plague and pestilence had been nurtured.

Of all cities of the modern epoch, and perhaps of ancient times, Moscow has suffered the most fearfully from fires. In 1536, it was nearly consumed, and two thousand persons perished. But this calamity was trifling to the dismal catastrophe of 1571, when beleaguered by the Tartars. They fired the suburbs, and a furious wind carried the flames into the heart of the capital, which the inhabitants could not quit except to die by the sword. A Dutch merchant who was present at the scene, and whose account is preserved in the Harleian MSS., speaks of the event as like a storm of fire, owing not only to the wind, but to the streets being "paved with great fir trees set close together, oily and resinous," while the houses were of the same material. Thousands of the country people had taken refuge in the city from the public enemy. The poor creatures ran into the marketplace, and were "all roasted there, in such sort that the tallest man seemed but a child, so much had the fire contracted their limbs—a thing more hideous and frightful than any can imagine." "The persons," he adds, "that were burnt in this fire were above two hundred thousand"—an exaggeration, doubtless, but an indication of a horrible incident.

A still more stupendous conflagration was the burning of Moscow in 1812, owing to its increased extent. If attended with fewer horrors, they were sufficiently rife,

for all who could not fly—the sick, infirm, and wounded—inevitably perished. Upon the approach of the French invaders, and the loss of the great battle of Borodino, it was determined to abandon the old capital of the Czars; and on Sunday, September 13th, its three hundred thousand inhabitants were suddenly aroused from a sense of security by a peremptory order to quit their houses, while the Russian army of defence filed through the midst of them in full retreat. On the morrow, the officers of the government and the police withdrew; the prisons were thrown open; and none were left but the incapable, and those who remained to execute the secret orders of the authorities. Towards evening the advanced guard of the enemy arrived, and before midnight Napoleon was in the Kremlin. The city, with its churches and palaces of semi-Asiatic architecture, rising above an immense mass of private dwellings, must have presented a strange, solemn, and even awful spectacle to the new comers. Not a Moscovite was to be seen; not a chimney smoked; not a sound was heard. An unclouded moon illuminated those deserted streets, vacant hotels, and empty palaces. "How does the city sit solitary that was full of people."

Scarcely were the French established in their new quarters, when smoke and flames were observed issuing from houses closely shut up in different districts. By Tuesday evening, the 15th, the fires had assumed a menacing aspect, distracting by their number the efforts made to quench them, while a high wind rapidly connected them with each other, and wrapped Moscow in a vast sheet of flame. Midnight was rendered as bright as day, for at that hour, at the distance of nearly a league, Dumas could read the despatches forwarded to him by the light of the burning metropolis. Thirty thousand houses, seven thousand principal edifices, and fourteen thousand inferior structures, were reduced to ashes. The private loss is supposed to have exceeded thirty millions sterling. "Palaces and temples," writes Karamsin, the Russian

historian, "monuments of art and miracles of luxury; the remains of past ages, and those which had been the creation of yesterday; the tombs of ancestors and the nursery cradles of the present generation, were indiscriminately destroyed." Napoleon shuddered at the sight as ominous of a series of disasters, and was compelled to decamp precipitately. Much mystery has been affected with reference to this transaction. But there can be little doubt that as it was intended to dislodge the French, it was the work of Rostopschin the governor, carefully prepared for, with the full consent of the cabinet of St. Petersburg. He was observed to bring along with him, on joining the army, a number of fire-engines. On being asked why he had brought such things, he replied that he had "good reasons for doing so. Nevertheless," he added, "as regards myself, I have only brought the horse I ride, and the clothes I wear."

"By their own hands their much-loved homes were fired,

By their own hands their thousand fancies expired;
Fierce burn the flames, that waft to yonder skies
The incense of the patriot sacrifice.

The wide bazaar, within whose stately walls
A kingdom's ransom filled the golden halls,
Rich as the fabled Phoenix' funeral bed,
In one full blaze of perfumed flame had fled;
Tower kindles tower, and fires on fires arise;
To aid the dreadful death the tempest flies,
Speeds with the swiftness of the mountain storm,
To where the Kremlin rears his iron form;
With wreathed flames his regal towers are crowned,
While hollow whirlwinds dance and moan around."

It is a curious fact that, the year after the

fire, seedling aspen plants sprang up everywhere among the ruins of the city. That tree is very abundant in Russia, particularly in the woods around Moscow. The seeds had been wafted by the winds; and if the inhabitants had not returned to the site, it would speedily have become one immense forest.

A prominent place belongs to Constantinople in the list of fire-doomed cities. In 1729, a conflagration which raged three days consumed twelve thousand houses, and no less than seven thousand persons; another, in 1745, of five days' duration, proved fatal to six thousand; a third, in 1751, cost a thousand lives; a fourth, in 1756, destroyed two thousand; a fifth, in 1791, the most destructive of all, swept away thirty thousand dwellings, and nearly eight thousand of their inmates. The Danish capital comes next to the City of the Sultan. Three times in the last century was Copenhagen burnt almost to the ground; and during the bombardment of 1807, a fire broke out which lasted three days, when four thousand persons perished. Gothenburg in Sweden, Flushing in Holland, Gabel in Bohemia, Gera in Saxony, and Geneva, may be added to the dismal catalogue. But no calamity of this nature, in the present century, has yet equalled that which befel the old city of Hamburg, in 1842, as to the value of the property destroyed, estimated at more than eight millions sterling, when the lives of three hundred persons are supposed to have been sacrificed, and most of the important public buildings were laid in ruins.



THE WHEAT-FIELD OF THE WORLD.

ALL travellers in the Western States speak of the amazing fertility of the boundless prairies. Better land than that of Illinois for cereal crops the world's surface probably cannot show. Enormous prairies stretch across the State, into which

the plough can be put at once. The earth is rich with the vegetation of thousands of years, and the farmer's return is given to him without delay. The land bursts with its own produce, and the plenty is such that it creates wasteful carelessness in the gathering of the crop. "Up in Minnesota,"

says Mr. Trollope, "I had been grieved by the loose manner in which wheat was treated. I have seen bags of it upset and left upon the ground ; the labour of collecting it was more than it was worth. There wheat is the chief crop, and as the lands become cleared and cultivation spreads itself, the amount coming down the Mississippi will be increased almost to infinity. Wheat and corn are sown by the thousand acres in a piece. I heard of one farmer who had 10,000 acres of corn."

In the San Joaquin Valley, California, there are three wheat farms, with areas respectively of 36,000, 23,000, and 17,000 acres. On the largest of these farms the wheat crop last year averaged 40 bushels to the acre, the yield running up on some parts of the farm to 60 bushels. The product of this farm for the year was 1,440,000 bushels. The boundary on one side of the farm is about seventeen miles long. At the season of ploughing ten four-horse teams were attached to ten gang-ploughs, each gang having four ploughs—or forty horses with as many ploughs were started at the same time, the teams following in close succession. Lunch or dinner was served at a midway station, and supper at the terminus of the field, seventeen miles distant from the starting-point. The teams returned on the following day. The wheat in this immense field was cut with twenty of the largest reapers. It would require over forty ships of medium size to transport the wheat raised here to a foreign market.

Thirty years ago grain and flour were sent westward out of the State of New York to supply the wants of those who had emigrated into the prairies, and now we find that it will be the destiny of these prairies to feed the universe. "Chicago is the main point of exportation north-westward from Illinois, and sends out from its granaries more cereal produce than any other town in the world. I went down to the granaries, and climbed up into the elevators. I saw the wheat running in rivers from one vessel into another, and from the railroad vans up into the huge

bins on the top stores of the warehouses—for these rivers of food run up-hill as easily as they do down. I saw the corn measured by the forty-bushel measure with as much ease as we measure an ounce of cheese, and with greater rapidity. I ascertained that the work went on day and night incessantly, rivers of wheat and rivers of maize ever running. I saw the men bathed in corn as they distributed it in its flow. I saw bins by the score laden with wheat, in each of which bins there was space for a comfortable residence. I breathed the flour, and drank the flour, and felt myself to be enveloped in a world of breadstuff. And then I believed, understood, and brought it home to myself as a fact, that here in the corn islands of Michigan, and amidst the bluffs of Wisconsin, and on the high table plains of Minnesota, and the prairies of Illinois, had God prepared the food for the increasing millions of the eastern world, as also for the coming millions of the western."

We must now give a description of the grain elevator; that is, the machinery by which the grain is transferred from the canal barge to the ocean-going vessel. To make it clear, it should be explained that the grain is carried loose in bulk: sacks or bags are never used.

The floating elevator resembles in appearance the body of a huge windmill. Its apparatus consists, in the centre, of the steam-engine by which the elevator is revolved, and a weighing machine which contains about forty bushels. On the left side is an endless band, carrying a series of iron scoops, similar to those used in the river-dredging machines. On the right of the elevator is a covered shoot, leading down to the hold of the ship.

We will suppose the elevator to have been fairly fixed in its position between the two vessels—the hold of the canal barge to be opened, and the feeding-shaft of the elevator placed in working order. The endless band, with its fifty iron scoops (each holding a bushel or a bushel and a half), is set in motion, and the grain is carried up

to the level of the elevator, each scoop successively emptying its contents into the square box in the centre, which serves, at one and the same time, to measure and weigh. When the square box (which holds forty bushels) is filled, the clock-work arrangement attached to the machine is set in motion, the motion of the feeding-shaft is suspended, and the trap-bottom of the weigher being released, the grain is precipitated into the shoot on the other side of the elevator. This operation is continued until the barge is entirely unloaded, when another takes its place. By this means a load of 10,000 tons can be cleared in four hours, and the "school" of 150 barges, with the aid of three or four elevators, be released for the homeward trip in about four days.

A popular writer has graphically described this interesting operation: "An elevator is as ugly a monster as has been yet produced. In uncouthness of form it outdoes those obsolete old brutes who used to roam about the semi-aqueous world, and live a most uncomfortable life with their great hungering stomachs and huge unsatisfied maws. The elevator itself consists of a big moveable trunk,—moveable as is that of an elephant, but not pliable, and less graceful even than an elephant's. This is attached to a huge granary or barn; but in order to give altitude within the barn for the necessary moving up and down of this trunk—seeing that it cannot be curled gracefully to its purposes as the elephant's is curled—there is an awkward box erected on the roof of the barn, giving some twenty feet of additional height, up into which the elevator can be thrust.

It will be understood, then, that this big moveable trunk, the head of which, when it is at rest, is thrust up into the box on the roof, is made to slant down in an oblique direction from the building to the river. For the elevator is an amphibious institution, and flourishes best on the banks of navigable waters. When its head is ensconced within its box, and the beast of prey is thus nearly hidden within the

building, the unsuspecting vessel is brought up within reach of the creature's trunk, and down it comes, like a mosquito's proboscis, right through the deck, in at the open aperture of the hold, and so into the very vitals and bowels of the ship. When there, it goes to work upon its food with a greed and an avidity that is disgusting to a beholder of any taste or imagination.

And now I must explain the anatomical arrangement by which the elevator still devours and continues to devour, till the corn within its reach has all been swallowed, masticated, and digested. Its long trunk, as seen slanting down from out of the building across the wharf and into the ship, is a mere wooden pipe; but this pipe is divided within. It has two compartments; and as the grain-bearing troughs pass up the one on a pliable band, they pass empty down the other. The system therefore is that of an ordinary dredging machine; only that corn, and not mud, is taken away, and that the buckets or scoops are hidden from sight. Below, within the stomach of the poor bark, three or four labourers are at work, helping to feed the elevator. They shovel the corn up towards its maw, so that at every swallow he should take in all that he could hold. Thus the scoops, as they ascend, are kept full, and when they reach the upper building they empty themselves into a shoot, over which a porter stands guard, moderating the shoot by a trap-door, which the weight of his finger can open and close. Through this doorway the corn runs into a measure, and is weighed. By measures of forty bushels each the tale is kept. There stands the apparatus, with the figures plainly marked, over against the porter's eye; and as the sum mounts nearly up to forty bushels he closes the door till the grains run thinly through, hardly a handful at a time, so that the balance is exactly struck. Then the teller standing by marks down his figure, and the record is made. The exact porter touches the string of another door, and the forty bushels of corn run out at the bottom of the measure, disappear down a shoot, and deposit themselves in the canal-boat."

HAIR-DRESSING EXTRAORDINARY.



TRAVELLERS have described the curious and fantastic modes of dressing the hair adopted by the natives of Africa. Some of them were very singular. At London the fashions of the natives reminded Livingstone

of the ancient Egyptians. Some of the ladies adopt the curious custom of attaching the hair to a hoop which encircles the head, giving it somewhat the appearance of the glory round the head of the Virgin. The hair is taken in single locks, stretched out to its greatest length, and fastened by the ends to the hoop which is held in place by strong wires, and its edge ornamented with shells. By means of gum-arabic and ashes the hair is retained in a variety of odd shapes till after some years it keeps the desired shape of itself. Sometimes it is like a cock's comb, and sometimes like a fan. One will have his hair done up in rolls over the head like ridges on a melon, while another trains his to stand out like the rays of the sun, as usually represented in pictures. Others wear an ornament of woven hair and hide adorned with beads, and some weave it into the form of buffalo horns. Among the Obbos, when a man's relative dies, his successor cuts off his hair and adds it to his own, so that their wigs sometimes attain a huge size. Some plait a fillet two inches wide, of the inner bark of trees, shave the wool off the lower part of the head to an inch above the ear, tie this fillet on, having rubbed it and the wool which is left with red

ochre mixed in oil. It gives them the appearance of having on a neat forage cap.

The Gallas dress up their heads in very fantastic fashions; sometimes shaving off the hair in the front, but leaving it on the crown, and plaiting that down in a circular plait, or training it into the form of a flat-crowned cap.

But most of the elaborate hair-dressing is on the heads of the men. The women frequently wear their hair in the simplest manner, perhaps for the reason that the wife does the cooking, cultivates the land, adorns the body of her husband with paint, tattoos him in wonderful patterns, and dresses his hair, which must be pretty well enough to keep her time fully occupied.



HOW SEWING-MACHINES ARE MADE.



THE inventor of the first working sewing-machine was a poor mechanic named Elias Howe, a native of Massachusetts, in America. Like James Hargreaves, the inventor of the spinning-jenny, it was whilst observing the weary labour of his wife and other poor women that Howe conceived the idea of a machine that should lighten their work. After incessant labour, during the latter part of which he and his family were indebted to a friend for the means of subsistence, he took out a patent for his sewing-machine. This was in the year 1841. His invention, however, did not meet with the encouragement it deserved, and Howe came to England, and after patenting it sold it to a London firm. On returning to his own country he found his patent pirated by a wealthy company; he, however, clearly established his rights, and in the course of a few years he became a wealthy man.

Many and various are the improvements that have been made in this invention since Howe first brought it into use. There are several rival companies, each claiming the superiority for its own machines. The following description of a walk through the extensive works of the Wheeler and Wilson Company, in Bridgeport, Connecticut, will interest our readers:—

The works of this manufactory cover about seven acres of ground, and for some time past have turned out fifty machines an hour. Their business employs in its various connections, as mechanics, salesmen, and agents, from six to seven thousand men and women. If we estimate, as is usually done, four persons to each family represented, we have a population of nearly or quite thirty

thousand, a good-sized inland city, it will be perceived, supported directly by this industry. There is a post-office in the establishment, and a very pleasant sight it is to see the men at noon gathering here for their letters and papers.

The work is carried on in a manner which may not be unusual, but which was novel to us. All tools and materials are furnished at a certain price to subordinates, who are jobbers or contractors, and who furnish the finished article, or, to speak more accurately, the article finished up to a certain point, at a definite sum per piece. The company reserve the right to accept or reject work, and also the right to discharge any workman, though employed by a contractor. Thus they keep control of their great establishment and yet give to their *employés* a share in the profits and an interest in its progress.

We follow our conductor out of the office, through a short passage-way into the large machine-room. Whew! what a change from absolute quietness to this ceaseless racket! It is a long room, and is full of machines, drilling, planing, turning, cutting, polishing away with indefatigable and tireless energy, every one busier than that traditional emblem of industry the bee: busier and buzzier, too, for never did any hive so hum and buzz with activity as this great hall.

The room is composed of two halls of unequal length, at right angles to each other. We ask our conductor how many machines he has at work here. He does not know. We count in one row twenty-eight, and there are five or six rows. We abandon in despair all attempt at making an estimate of the entire number. They are for the most part lathes and drills. Every conceivable and inconceivable kind of turning and boring is performed here. Oil, oil, oil everywhere; the whole room is

soaked in oil. And yet, despite its superabundance, the iron and steel in certain of these manifold operations smoke with the heat of the friction. This is the room where the bobbin and hook, the centre and heart of the sewing-machine, are made, or rather finished.

The operation of the hook and bobbin is exceedingly simple when seen at work, but very difficult to describe. In the Wheeler and Wilson machines the needle plays up and down from above, forming one thread of the stitch, while the hook catches it from below and locks it into the other thread, forming what is termed the "lock-stitch." The bobbin is the spool which furnishes the lower thread; it lies in the machine close against the hook.

The work involved in the manufacture of the sewing-machine is apparent from the statement that the bobbin alone has to go through seven distinct machines before it is completed and ready for use, and that the glass plate in the pressure-foot goes through from eighteen to twenty-five distinct operations. It is perhaps better illustrated in an adjoining apartment—the furnace-room. Here we trace the first step in the manufacture of the hook. A furnace and a stamping-machine stand side by side. The stamping-machine is operated on a principle somewhat analogous to that of a pile-driver. An immense weight is lifted up by machinery, till it reaches the desired height, then falls with a clang on the rod. The machine is four-sided, and the rod, heated in the adjoining furnace, goes from one side to the other till it has completed the circuit. The hook (wheel and shaft) is made from one solid piece of metal—an improvement on the old method. Thence it goes into the lathe-room to be turned into its final form—"the rotating hook."

An even more striking illustration of the complicated operations required is afforded by the history of the needle, which enters the needle-room a long coil of wire and issues from it ready for the sewing-machine. In the course of this circuit it goes through ten distinct operations.

The most picturesque operation in the whole factory is that of tempering the springs. The capacious and lofty hall, with its smoke-begrimed walls and dusty atmosphere, filled with stalwart workmen, their faces and brawny arms lighted with the glare from the many forges, and the banging and clanging of hammers large and small, all form accessories to the grand illumination from the burning oil. The springs, though a seemingly small part of the sewing-machine, perform a very important function: on their perfection largely depend the accuracy and smoothness of the working of the whole. The tempering of these springs, therefore, is a work requiring very great care and accuracy in the workman. An assistant arranges a number of them on a sort of frame so that they present the appearance of a wicker-basket. The workman then heats them to an intense heat in his furnace, determining the heat by the colour, and then plunges them into a pail of oil, which is itself kept cool by being immersed in a large tub of water. The oil blazes up instantly, lighting the spot with a peculiar lurid glare, but goes out when the springs are withdrawn. The oil quickly burns off from them, the workman meanwhile revolving them slowly in the air. Everything in this operation depends upon his skill and judgment. It sometimes seems as though there were nothing which machinery could not do; but it can never do the work of brains; it can never exercise judgment.

Then there is the polishing-room, where the emery-wheels are revolving with incalculable speed, lighting up the face of the operator with a shower of sparks; there is the carpenter's shop, where the cases for these machines, themselves of various forms and patterns, are in process of manufacture; there is the casting-room, where the castings are made; there is the great engine-room, which supplies all the "power"; there is the finishing-room, where the various parts of the machine, made by so many different hands, are put together and adjusted; and the trying-room, where a hundred or so of sewing-machines, in a row,

are busily at work doing nothing, driven by steam in a profitless industry, the office of which is to see that they are really ready for the market.

In an article on sewing-machines, the *Times* says, "The majority of sewing-machines make what is called the lock-stitch, by far the most durable method of sewing. In order to accomplish this, a loop of thread is thrust by the eye-pointed needle through the material to be sewn. This loop is threaded by a shuttle, and by this means is made to interlock within its substance—a very important feature, inasmuch as the fastening of the thread is protected from the friction of wear in washing. All machines used in trades where strength of sewing is required make this stitch; indeed, cloth and leather work would not bear the loop-

stitch fastening, which is made outside of the material sewn, and forms a ridge very liable to be worn away. The Wheeler and Wilson machine, which is the one best calculated for household work, makes the lock-stitch by means of a rotating hook, which interlaces the thread on the under side and does away with the necessity for the shuttle, which is unnecessarily noisy. There are other machines which substitute a looper for the shuttle, and make a single-thread loop-stitch which is apt to unravel. Some of these sewing-machines are very extravagant in the use of thread, one making a double loop-chain, using five yards of thread to one of sewing. This is a serious matter looked upon in a manufacturer's point of view, where the great and all-important aim is to economise the material."



DAMMING OUT THE OCEAN.

BESIDE the most marvellous results of human labour and perseverance may be placed the dikes and "polders" of Holland. In that country eight of the provinces are below the level of the sea, which is only kept out by enormous dikes. The Waterstaat, or department of the Government which has the superintendence of these works, is, therefore, of great importance, and is invested with almost unlimited power. Any person may be summoned at its command to resist that most formidable enemy of the State, water.

Holland itself is merely the natural estuary of the Rhine, the Meuse, the Scheldt, the Waal, the Leek, and the Yssel. It is but a delta, formed from the soil brought down by these rivers from Central Europe; and if nature had her way we should see "great rivers wandering about

among their towns and villages in search of new outlets to the sea." As it is, no human foresight can always avail to guard against catastrophes, for if the wind heaps up the waters of the German Ocean against the coast, thus preventing the discharge of the rivers, and if, at the same time, these rivers are swollen by the breaking up of the ice or a heavy rainfall, the waters overflow the dikes and spread over the country.

At various times fearful inundations have happened, and many thousands of persons have perished. Enormous amounts have, therefore, been spent upon the dikes. Three hundred millions sterling have been spent by the Waterstaat within the tract of country lying between the Dollart and the Scheldt, hardly as large as Wales and Yorkshire put together. Three hundred miles of dikes protect the islands of Zeeland from the outer and inner waters. Some of them have a foundation one hundred and fifty feet in width, and are forty feet high, with a granite facing, being thatched with

turf, and surmounted by a carriage-road, lined with trees. Their maintenance is so expensive (says *Chambers's Journal*) that had they been originally made of copper they would have been less costly.

It is interesting to notice what has been effected in the way of reclamation of the inland waters. Haarlem Meer is the most signal example. Until the sixteenth century it was of insignificant dimensions; but the wind, driving its waters forward, united with it five neighbouring lakes. Every storm further extended it, and the conversion of North Holland into an island was seriously threatened. Its area was about seventy square miles, and it required four or five thousand pounds per annum to keep up its banks. Its reclamation was proposed as early as 1640 by Leeghwater—a celebrated engineer, who had recovered eighteen thousand acres in North Holland, known as the Beemster Polder, and who possessed the singular accomplishment of being able to remain for a considerable time under water, and there eat, write, or play on musical instruments. It was not, however, till 1840 that the work was undertaken, one of the monster pumping-engines being appropriately named the Leeghwater; and it was completed in 1852. The cost was nearly a million, but the sale of forty-two thousand acres covered the outlay.

It must be remembered that a polder, or drained lake, has not only to be pumped dry, but to be kept dry—a task which has not to be encountered in other countries. The excess of rainfall over evaporation and the probable amount of spring or ooze-water have, therefore, to be considered, and, above all, the height to which the water has to be lifted, for on this mainly hinges the question of profit. Such enterprises are commonly in the hands of private companies; but extensive schemes, such as Haarlem Meer, are undertaken by the Waterstaat. When a lake is drained, the area is divided into parallelograms, often not much exceeding an acre in size; and these are separated by what are called primary canals. A certain number, perhaps

a dozen, of them are grouped together; and their superfluous water is pumped into transverse canals of a higher level, communicating with the main outlets to the sea. In the case of the Beemster there are four canal systems, of different levels; and every drop must pass through each of them in its passage to the ring-dike which surrounds the polder. This ring is always constructed in duplicate, and windmills are erected on its banks. Steam-power has not at present been much used. Poldered land is usually exempt from taxation for twenty years. Residence upon it is not found unhealthy, nor is it difficult to get rid of superfluous water. When, however, the wind blows continuously from the sea it becomes necessary to close the sluices in order to prevent the ingress of the ocean; and if this happens during the rainy season, the basins into which the polders are drained become brimful, the land is flooded, and all agricultural operations are suspended until the wind changes. The reclamation of the Zuider Zee is confidently looked forward to; and it is partly in view of this that the North Holland Canal is being constructed, to give Amsterdam direct access to the North Sea and avoid the dangerous and circuitous route by the Texel. Its width will allow of two men-of-war passing one another at any point.

Most of the polders were once bogs, and became lakes through the removal of layers of turf for the purposes of fuel. Peat, indeed, is one of the chief productions of the country. Its ashes make a good manure, its soot cleans pots and pans, and its smoke preserves smoke and fish. The removal of the peat frequently lays bare rich alluvial land, and sometimes carries cultivation twenty feet below the original surface. This process has been going on for many centuries, for Tacitus describes the Belgæ as burning their ground for want of fuel and drying it by the sun. The consent of the Waterstaat is now requisite before the ground-level may be reduced. Floating islands were once not uncommon, and strips of them might be cut off and floated down

to market. Many a farmer was obliged to tether his fields to prevent their floating away; and when it was desirable to keep flocks and herds separate these fields have been pushed off from the shore and anchored at a distance. Then perhaps a storm has suddenly arisen, the fields have dragged their anchors and floated out to sea. But such curious incidents are now rare.

If the Dutch have thus a constant battle with the elements they have the satisfaction of thinking that to their precarious situation they owe their independence. It was by the piercing of the dikes that the siege of Leyden was raised; and it was the amphibious fishermen of Zeeland—who took as their motto, “Rather Turks than Papists,”—

who offered the stoutest resistance to Spanish tyranny. Even peat has played a part in its annals. A huge canal-boat, apparently laden with peat, was unsuspectingly taken by the Spaniards into Breda; and eighty armed men, issuing from it at dead of night, admitted Prince Maurice and his army into the town. Moreover, in 1593, a causeway, traversing some bogs, having been obstructed by trees being laid across it, the Spaniards set them on fire; and, the flames seizing on the causeway and surrounding turbaries, they were obliged to raise the siege of an important fortress.

It is said that Philip II., on hearing of this incident, declared that since Holland was combustible it should be burnt to ashes.



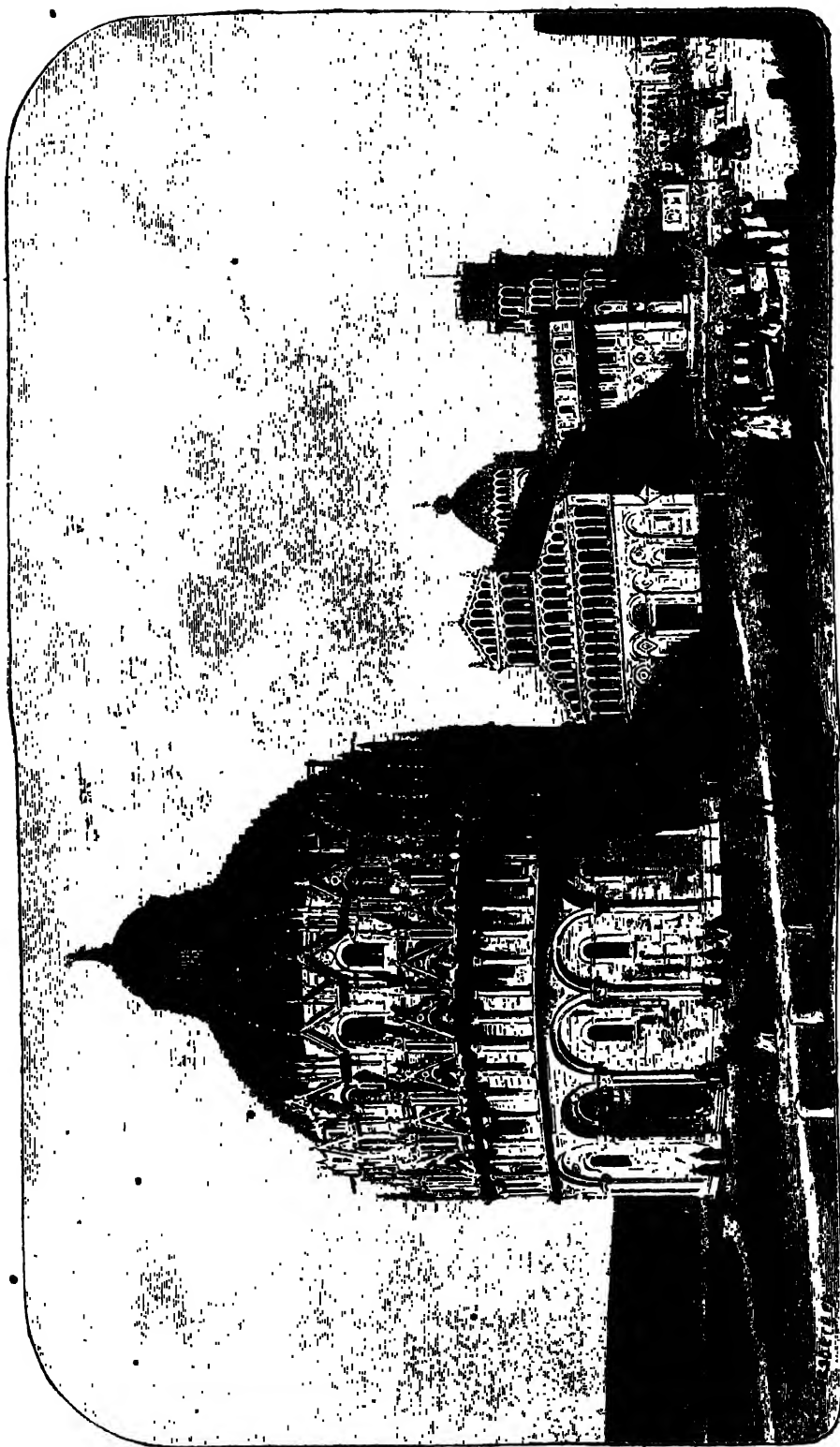
THE LEANING TOWER OF PISA.

GROUPED together in one “sacred corner” are the remains of the ancient glories of Pisa. The Cathedral, the Baptistery, the Leaning Tower, the Campo Santo, a form combination of buildings scarcely surpassed in interest and beauty by any in the world. The cathedral, erected to commemorate the victory of the Pisans over the Saracens in Sicily in 1063, is one of the most regular, beautiful, and lightsome pieces of Gothic architecture to be seen in Europe. The choir is of the finest marble, and the roof is supported by eighty columns of the same stone, each of one solid piece. The pavement is of tessellated marble; and the gates, which are of brass, are exquisitely wrought with the history of our Saviour’s birth, life, and passion. The most celebrated portion, however, is the campanile, or leaning-tower, which stands detached. This erection is of a round form, and 190 feet high, entirely built of white marble. It was begun in 1174, but was not completed till about the

middle of the fourteenth century. It is ascended by 230 steps, has several galleries on the outside, and is open in the interior. From the summit a magnificent view is gained, extending, on the one side, far over the Mediterranean, to Gorgona or even Corsica.

The tower stands not less than 15 feet out of the perpendicular. Some conceive this reclining position, which produces a very singular effect on the traveller, to be occasioned by a sinking of the foundation on one side, and others, to the ancient builders aiming at eccentricity in erecting this remarkable tower; but, as the observatory and baptistery, which stand in the same square, have also a slight inclination, there can be little doubt that the former is the correct opinion.

The only other lofty structure known to incline so much from a perpendicular position is the leaning-tower of Saragossa, in Spain, which was erected in 1503. It is built entirely of brick, and stands in the centre of the square of San Felippo, in solitary grandeur, insulated and lofty, being ascended by a stair of 284 steps.



BAPTISTERY, CATHEDRAL, AND LEANING TOWER, PISA.

UNDER NIAGARA FALLS.



WE give in our frontispiece a representation of one of the greatest natural wonders of the world. A young English traveller thus records his impressions of this sublime spectacle :—

“I reached Niagara in the grey morning. Stepping from the train, all seemed cold and cheerless; and I hurried off to the hotel to refresh myself and rest till breakfast time. The dull, unceasing roar from the cataract was plainly heard, though it was more than two miles off. It is said that in the still, calm nights of summer it can be heard at Toronto—a distance of thirty miles! Crossing the railway bridge connecting the United States with Canada, I walked for half an hour along the high bank of the river, till, turning a bend in the road, I came suddenly in view of the world famed Falls.

Some travellers have expressed disappointment at their first view of the Niagara, as not coming up to the expectation their imaginations had formed of it. This was not my case. I had pictured to myself a very grand scene; but the reality far surpassed it, for no one can imagine the sublimity of the dull, thundering *sound* from the falling mass of water. Approaching the table-like ledge from which it is precipitated, I stood in silent awe. The rapids above, with the water wildly careering on its rocky bed, the toppling over of the immense mass, twenty feet deep on the brink of the chasm, and the white spray, rising like a cloud from the boiling cauldron below, left an ineffaceable impression on my mind; and then to think that this has been continually going on, night and day, summer and winter, for thousands of years! I cannot conceive how any one can be disappointed on first beholding this majestic spectacle.

Niagara is the outlet for the waters of Lake Erie, which pass on through Niagara River to Lake Ontario. The grand chain of inland seas which forms its reservoir comprises Lake Superior, 30,000 square miles in area; Lake Michigan, 22,600; Lake Huron, 21,000; Lake Clair, 700; and Lake Erie, 6,000. These, with their tributaries, cover a surface of 150,000 square miles, and, by a careful calculation, contain about one-half of all the fresh water of the globe. Below the Falls the river runs for miles through a ravine, the sides of which are as steep as those of a grave. Through this long gorge, silent and awful, rolls the deep flood, carrying masses of froth on its whirling and boiling surface. In its narrowest part, a short distance below the Suspension Bridge, the current runs with such velocity as to rise up in the middle from ten to fifteen feet above the sides! and in turning a sharp bend in the river causes a complete whirlpool. The impression made upon my mind, as I walked up to the Falls from the bridge, was that the bed of the river had suddenly sunk down from 200 to 300 feet below its former level.

One of the best views is obtained from the Canadian side, where the Horseshoe Fall, 160 feet in height, sweeps round in a noble curve of nearly 2,000 feet to Goat Island; from this point to the southern shore it is called the American Fall, rather less than 1,000 feet in width. The mass of water thrown over the Falls is estimated at $19\frac{1}{2}$ millions of cubic feet per minute! The water is gradually cutting away the rock over which it tumbles. It is said that the Falls are receding at the rate of fifty feet in forty years. But as at this rate it is computed that the operation will take at least 35,000 years, visitors may ‘calculate’ on enjoying the sight of this magnificent cataract a while longer.

Just beside the Horseshoe Fall is erected



pending staircase, leading from the top of the bank down to the level of the rocks below. Paying the usual fee, and clad in a waterproof suit, I made one of a party, under the guidance of a negro, and went down behind the mass of water. It was a fearful sight. The ground trembled with the weight of the watery avalanche. On our right the wall of rock, the overhanging ledge above, black and wet with the spray, the volume of water on the left forming a semi-transparent wall, and the deafening tumult of the seething gulf, all combined to test the firmness of one's nerves. I was not sorry when the other members of our little party considered that they had had their money's worth. It is said that there are twenty feet of water above the ledge at this point; it is certain that the *Detroit*, a ship drawing eighteen feet of water, passed over without touching the rock.

Many fatal accidents have occurred here. There is an affecting legend of an Indian, who was unwittingly caught in the treacherous current above the Falls, and who, finding that escape was hopeless, with the composure of his race, sat quietly in his canoe, and, singing the death-song of his people, was borne into eternity with the mournful sounds lingering on his lips. The Indians, as a nation, have long been driven from this part of the country; the few who are left inhabit the village of Tuscarora, eight miles from the Falls, and are chiefly employed as tillers of the soil. Those I saw were by no means favourable representatives of 'the noble savage.'"

Professor Tyndall gives the following vivid description of his visit to Niagara:—

"On the first evening of my visit, I met the guide to the Cave of the Winds. He was in the prime of manhood—large, well built, firm and pleasant in mouth and eye. My interest in the scene stirred up his, and made him communicative. Turning to a photograph, he described, by reference to it, a feat which he had accomplished some time previously, and which had brought him almost under the green water of the Horseshoe Fall. 'Can you lead me there

to-morrow?' I asked. He eyed me inquiringly, weighing, perhaps, the chances of a man of light build, and with grey in his whiskers, in such an undertaking. 'I wish,' I added, 'to see as much of the Fall as can be seen, and where you lead I will endeavour to follow.' His scrutiny relaxed into a smile, and he said, 'Very well; I shall be ready for you to-morrow.'

On the morrow, accordingly, I came. In the hut at the head of Biddle's Stair I stripped wholly, and re-dressed according to instructions,—drawing on two pairs of woollen pantaloons, three woollen jackets, two pairs of socks, and a pair of felt shoes. Even if wet, my guide urged that the clothes would keep me from being chilled, and he was right. A suit and hood of yellow oil-cloth covered me well. Most laudable precautions were taken by the young assistant of the guide to keep the water out, but his devices broke down immediately when severely tested.

We descended the stair, the handle of a pitchfork doing in my case the duty of an alpenstock. At the bottom my guide inquired whether we should go first to the Cave of the Winds, or to the Horseshoe, remarking that the latter would try us most. I decided to get the roughest done first, and he turned to the left over the stones. They were sharp and trying. The base of the first portion of the cataract is covered with huge boulders, obviously the ruins of the limestone ledge above. The water does not distribute itself uniformly among these, but seeks for itself channels through which it pours torrentially. We passed some of these with wetted feet, but without difficulty. At length we came to the side of a more formidable current. My guide walked along its edge until he reached its least turbulent portion. Halting, he said, 'This is our greatest difficulty; if we can cross here, we shall get far towards the Horseshoe.'

He waded in. It evidently required all his strength to steady him. The water rose above his loins, and it foamed still higher. He had to search for footing, amid

unseen boulders, against which the torrent rose violently. He struggled and swayed, but he struggled successfully, and finally reached the shallower water at the other side. Stretching out his arms, he said to me, 'Now come on.' I looked down the torrent as it rushed to the river below, which was seething with the tumult of the cataract.

Considering the possibility of an accident, I entered the water. Even where it was not more than knee-deep, its power was manifest. As it rose around me, I sought to split the torrent by presenting a side to it; but the insecurity of the footing enabled it to grasp the loins, twist me fairly round, and bring its impetus to bear upon the back. Further struggle was impossible; and, feeling my balance hopelessly gone, I turned, flung myself towards the bank I had just quitted, and was instantly swept into shallower water.

The oil-cloth covering was a great encumbrance—it had been made for a much stouter man; and, standing upright after my submersion, my legs occupied the centres of two bags of water. My guide exhorted me to try again. Prudence was at my elbow, whispering dissuasion; but, taking everything into account, it appeared more immoral to retreat than to proceed. Instructed by the first misadventure, I once more entered the stream. Had the alpenstock been of iron, it might have helped me; but, as it was, the tendency of the water to sweep it out of my hands rendered it worse than useless. I, however, clung to it by habit. Again the torrent rose, and again I wavered; but, by keeping the left hip well against it, I remained upright, and at length grasped the hand of my leader at the other side. He laughed pleasantly. The first victory was gained, and he enjoyed it. 'No traveller,' he said, 'was ever here before.' Soon afterwards, by trusting to a piece of drift-wood which seemed firm, I was again taken off my feet, but was immediately caught by a protruding rock.

We clambered over the boulders towards

the thickest spray, which soon became so weighty as to cause us to stagger under its shock. For the most part nothing could be seen; we were in the midst of bewildering tumult, lashed by the water, which sounded at times like the cracking of innumerable whips. Underneath this was the deep, resonant roar of the cataract. I tried to shield my eyes with my hands, and look upwards; but the defence was useless. My guide continued to move on, but at a certain place he halted, and desired me to take shelter in his lee and observe the cataract. The spray did not come so much from the upper ledge as from the rebound of the shattered water when it struck the bottom. Hence the eyes could be protected from the blinding shock of the spray, while the line of vision to the upper ledges remained to some extent clear. On looking upwards over the guide's shoulder, I could see the water bending over the ledge, while the Terrapin Tower loomed fitfully through the intermittent spray gusts. We were right under the tower. A little farther on, the cataract, after its first plunge, hit a protuberance some way down, and flew from it in a prodigious burst of spray; through this we staggered. We rounded the promontory on which the Terrapin Tower stands, and pushed, amidst the wildest commotion, along the arm of the Horseshoe, until the boulders failed us, and the cataract fell into the profound gorge of the Niagara River.

Here my guide sheltered me again, and desired me to look up; I did so, and could see, as before, the green gleam of the mighty curve sweeping over the upper ledge, and the fitful plunge of the water as the spray between us and it alternately gathered and disappeared.

We returned, clambering at intervals up and down, so as to catch glimpses of the most impressive portions of the cataract. We passed under ledges formed by tabular masses of limestone, and through some curious openings formed by the falling together of the summits of the rocks. At

length we found ourselves beside our enemy of the morning. My guide halted for a minute or two, scanning the torrent thoughtfully. I said that, as a guide, he ought to have a rope in such a place; but he retorted that, as no traveller had ever thought of coming there, he did not see the necessity of keeping a rope.

He slowly but firmly waded in. The struggle to keep himself erect was evident enough; he swayed, but recovered himself again and again. At length he slipped, gave way, did as I had done, threw himself flat in the water towards the bank, and was swept into the shallows. Standing in the stream near its edge, he stretched his arm towards me. I retained the pitchfork handle, for it had been useful among the boulders. By wading some way in, the staff could be made to reach him, and I proposed his seizing it. 'If you are sure,' he replied, 'that, in case of giving way,

you can maintain your grasp, then I will certainly hold you.'

Accordingly I waded in, and stretched the staff to my companion. It was firmly grasped by both of us. Thus helped, though its onset was strong, I moved safely across the torrent.

All danger ended here. We afterwards roamed sociably among the torrents and boulders below the Cave of 'the Winds. The rocks were covered with organic slime, which could not have been walked over with bare feet, but the felt shoes effectually prevented slipping. We reached the cave, and entered it, first by a wooden way carried over the boulders, and then along a narrow ledge to the point eaten deepest into the shale. When the wind is from the south, the falling water, I am told, can be seen tranquilly from the spot; but when we were there a blinding hurricane of spray was whirled against us."



A MAN AND TIGER FIGHT.

REPORTS of a sanguinary character are delighted in by most eastern princes. At entertainments given in honour of distinguished visitors, nothing is more common than to pit a tiger against an elephant or a buffalo, or to worry a bull by ferocious dogs. Occasionally, however, these modes of cruelty are refined upon, and human beings are made to fight for their lives with wild beasts. The following is a graphic account of one of these terrible combats, in which, as will be seen, the man came off victorious:—

"The next scene was of a more awful character. A man entered the arena armed only with a long knife, and clothed in short trousers, which extended only half-way down the thighs. The instrument which

he wielded in his right hand was a heavy blade, something like the coulter of a plough, about two feet long, and fully three inches wide, gradually diminishing towards the handle, with which it formed a right angle. This knife is used with great dexterity by the Coorgs, being swung round in the hand before the blow is inflicted, and then brought into contact with the object intended to be struck, with a force and effect truly astonishing.

The champion who now presented himself before the rajah was about to be opposed to a tiger, which he volunteered to encounter almost naked, and armed only with the weapon which I have just described. He was rather tall, with a slight figure, but his chest was deep, and his arms were long and muscular. His legs were thin, yet the action of the muscles was perceptible with every movement, while the freedom of his gait and the few contortions he performed

preparatory to the hazardous enterprise in which he was about to engage, showed that he possessed uncommon activity, combined with no ordinary degree of strength. The expression of his countenance was absolutely sublime, when he gave the signal for the tiger to be let loose; it was the very concentration of moral energy, the index of a high and settled resolution. His body glistened with the oil that had been well rubbed over it to promote the elasticity of his limbs.

He raised his arm for some moments above his head when he made the signal to admit his enemy into the arena. The bars of a large iron cage were instantly lifted from above; a huge royal tiger sprang forward and stood before the Coorg, waving his tail slowly backward and forward, erecting the hair upon it, and uttering a suppressed howl.

The animal looked first at the man, then at the gallery where the rajah and his court were seated to see the sports, but did not appear easy in its present state of freedom, and was evidently confounded at the novelty of its position. After a short survey, it turned suddenly round and bounded into its cage, from which the keepers, who stood above, beyond the reach of mischief, tried to force it, but in vain. The bars were then dropped, and several crackers fastened to its tail, which projected through one of the intervals.

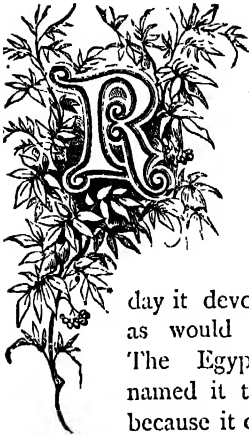
A lighted match was hastily put into the hand of the Coorg, the bars were again raised, and the crackers ignited. The tiger now darted into the arena with a terrible yell, and while the crackers were exploding, it leaped, turned, and writhed as if in a state of frantic excitement. It at length crouched in a corner, snarling as a cat does when alarmed. Meanwhile its retreat had been cut off by securing the cage. During the explosion of the crackers the Coorg stood watching his enemy, and at length advanced towards it with a slow but firm

step. The tiger roused itself and retreated, the fur on its back being erect, and its tail apparently dilated to twice its usual size. It was not at all disposed to commence hostilities, but its resolute foe was not to be evaded. Fixing his eyes intently on the fierce animal, he advanced with the same deliberate and measured step, the tiger retreating as before, but still presenting its front to its enemy.

The Coorg now stopped suddenly; then, moving slowly backwards, the tiger raised itself to its full height, curved its back for a spring, and lashed its tail, evidently meditating mischief. The man continued to retire, and as soon as he was at so great a distance that the fixed expression of his eye was no longer distinguishable, the ferocious brute suddenly bounded forward, crouched, and sprang with a short, sharp growl. Its adversary, fully prepared for this, leaped actively on one side, and, as the tiger reached the ground, swung round his heavy knife, and brought it with irresistible force upon the animal's hind leg, just above the joint. The bone was instantly severed, and the tiger effectually prevented from making a second spring. The wounded beast roared; but, turning on the Coorg, who had by this time retired several yards, advanced fiercely upon him, his wounded leg hanging loose in the skin, showing that it was broken.

The tiger, now excited to a pitch of reckless rage, rushed forward upon its three legs towards its adversary, who stood, with his heavy knife upraised, awaiting the encounter. As soon as the savage creature came within his reach, he brought down the ponderous weapon upon its head with a force which nothing could resist, laid open the skull from ear to ear, and the vanquished foe fell dead at his feet. He then coolly wiped the knife on the animal's hide, made a dignified salaam to the rajah, and retired amid the loud acclamations of the spectators."

PELICANS AND FLAMINGOES.



RELIABLE authorities tell us that the pelican has an appetite so insatiable, and a stomach so capacious, that in one

day it devours as much food as would satisfy six men. The Egyptians have nicknamed it the "river camel," because it can imbibe at once

more than twenty pints of water. Certainly it only makes two meals a day ; but, oh, what meals they are !

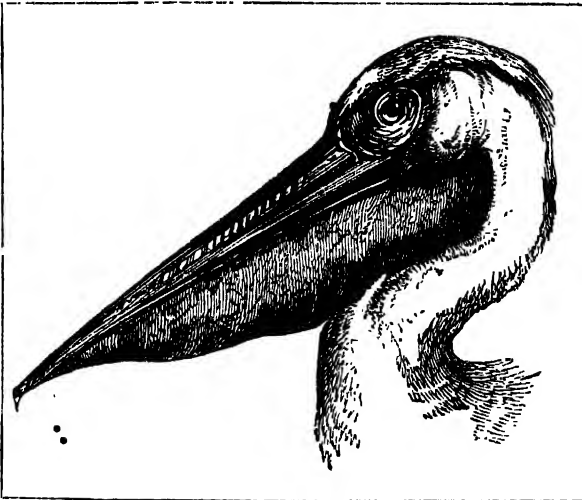
Pelicans often travel in considerable flocks, visiting the mouths of rivers or favourite retreats on the sea-coast. When they have made choice of a suitable fishing-place they arrange themselves in a

wide circle, and begin to beat the water with extended wing, so as to drive the fish before them, gradually diminishing the circle as they approach the shore or some inlet on the coast. In this manner they get all the fish together into a small space, when the common feast begins. After gorging themselves they retire to the shore, where the process of digestion follows. Some rest with the neck over the back ; others busily dress and smooth their plumage, waiting patiently until returning appetite invites them to fresh exertions. When thus quiescent, occasionally one of these birds empties

his well-lined pouch, and spreads in front of him all the fish that it contains, in order to feed upon them at leisure. This pouch, which plays so important a part in the pelican's life, is composed of two skins, the outer one being a prolongation of the skin of the neck ; the inner one is contiguous to the coating of the œsophagus.

The pelican is more common in tropical regions than in temperate climates. It is rarely seen more than twenty leagues from land. Levaillant describes one of those wonderful ornithological scenes which only

occur in uninhabited regions. At the entrance of Saldanha Bay, on the southwest coast of Africa, after wading through the surf and clambering up the rocks, "all of a sudden there arose from the surface of the island of Dassen-Eyland an impenetrable cloud,



which formed at the distance of forty feet above our heads an immense canopy composed entirely of aquatic birds—cormorants, sea-gulls, sea-swallows, pelicans, etc. I believe the whole winged tribes of this part of Africa were here assembled. Their voices, harsh and discordant, formed a noise so unmusical that I was every moment compelled to cover my head in order to relieve my ears. The alarm we created was so much the more general, inasmuch as the birds disturbed were chiefly sitting females. They had nests, eggs, and young to defend.

Flamingoes inhabit the margins of lakes and ponds, more rarely the sea shore. They feed on worms, molluscs, and the spawn of fishes, which they capture by the

following stratagem :—Placing their long neck and head in such a position that the upper mandible of their bill is the lowest, they stir the mud about in every direction, they



A TROPICAL SCENE.

thus easily succeed in disturbing the small fish which have settled in it, and capturing them while blended with the thick sediment. They also use their feet for work-

ing the ooze and detaching the fry and spawn, to which they are partial. They love company and live in flocks, which are subject to strict discipline. When they

are fishing they draw themselves up into long, straight, and regular files, protected by sentinels whose office is to give a signal of alarm on the approach of danger. If any cause for uneasiness should arise, the scout birds give a piercing cry, not unlike the note of a trumpet, and the whole flock would immediately wing their way to a place of security. Some authors have asserted that the flamingo makes use of its long neck as a third leg, walking with its head resting on the ground like a foot. The fact that has doubtless given rise to this supposition is the position of the neck, necessitated by its peculiar method of seeking food. We are told about a flamingo reared in captivity, which, being accidentally deprived of one of its limbs, found out a remedy for its infirmity by walking on one leg and helping itself along by means of its bill, using the latter as a crutch. The master of the bird noticing this, fitted it with a wooden leg, which it

used with the greatest success. But this story, which applies very well to a domesticated bird, which was maimed and consequently under peculiar conditions, in no way invalidates our former observations.

The flamingo makes itself a nest which is as original as its own personal appearance. It consists of a truncated cone about twenty inches in height, and formed of mud dried in the sun. At the summit of this little hillock it hollows out a shallow cavity in which the female lays two eggs, rather elongated in shape, and of a dead white colour. When she is incubating she sits astride on this novel description of throne with her legs hanging down on each side. The young ones run about very soon after they are hatched, but it is some time before they are able to fly, not indeed until they are clothed with their full plumage. At two years old they assume the more brilliant colours of the adult bird.



A SWIMMING ISLAND.

SOME distance to the south-east of Riga, in the province of Livonia, lies the Ilsing lake. It is noteworthy for a remarkable swimming island, which has annually arisen, since time immemorial, out of the depths of the lake. The time of its appearance is usually in July. During a month or two it becomes thinly covered with a little scanty grass, and in September or October, with the earliest frost, sinks again to the bottom to hold its winter sleep until the following year. In warm seasons the island rises earlier than in cold years; it happened once, indeed, one especially inclement, rainy summer, that it never made its appearance at all. As if to atone for this want of punctuality, a case also has been known when, the summer heats being unusually fervent

and of long continuance, the island remained longer than customary upon the surface; severe frost suddenly set in and took the laggard prisoner, but as soon as a thaw occurred in spring, it hastened to disappear until the following July.

The oldest people in the neighbourhood remember the periodical visits of this phenomenon from their earliest youth, and testify to its invariable reappearance in the same place. It is spoken of by a Livonian writer in 1780, and has been described in geographical accounts of the province; but hitherto no reliable explanation of its origin has been made known. During my tour I visited the spot, in company with a friend acquainted with chemistry, and after some examination we succeeded in penetrating the cause of the mystery.

The island is situated some hundred fathoms from the north-western shore of the Ilsing lake, and rises about eight inches

above the surface. In calm weather, when no wavelets arise to wash away the upper earthy crust, it possesses a superficies of fifteen to twenty yards, allowing of several persons moving about with ease. The entire fabric consists of a species of peat or interwoven rootlets of various plants, including moss and aquatic growths of many feet in length. The network does not rest upon the bottom of the lake, but swims freely upon the surface, so that a pole can be moved about with ease in various directions underneath. Upon one side it inclines downwards, and is here firmly attached to the peaty substance forming the bed of the lake. Owing to this circumstance it constantly reappears at the same spot.

The periodical disappearance of the island admits of simple explanation. Among the semi-carbonised plant-roots of which it principally consists, light carbonated hydrogen is present in most unusual quantity. The slightest touch develops the gas in millions of tiny bubbles from between the roots. By means of a small portable apparatus, we collected a portion of gas, which, being lighted, kindled immediately with a strong yellowish flame. The extraordinary amount of gas was in itself surprising; for although inflammable air of this character can generally be found in stagnant pools, swamps, and morasses, its occurrence in such volume is exceedingly rare.

As soon as the heat of the sun raises the temperature of the lake, this light gas is developed from the peat; the network of roots is filled with innumerable little shining bubbles. The island is thereby rendered light, and finally rises like a sort of half-opened bladder to the surface of the lake. As also during winter mud and earth collect upon the top, forming a kind of humus or soil, this rises with the rest, and affords the

means of the island becoming covered with a light growth of grass and aquatic plants. In warm summers of long continuance the place is more densely clothed than in colder seasons. At such times it frequently appears as early as June, and does not vanish until late in October. As soon as the water grows cold and the first night frosts occur, the development of gas naturally ceases; the great bladder grows heavy, closes, and sinks once more to the bed of the lake, in order, as the country folks say, to go to sleep for the winter.

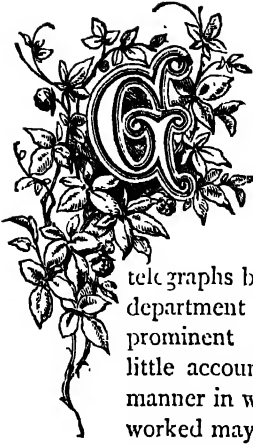
A glance tells what has been the course of formation of the Ilsing lake. A large peat moor formerly occupied the spot, through the middle of which flowed a little brook. Long years ago a water-mill was set up, to procure the power of which the brook was dammed, and the entire moor thereby laid under water. The banks of the lake consist of sand, of which the stratum beneath the peat upon the bed of the lake is also probably composed. The island, therefore, when lifted by the development of the gas, separates from the sandy bottom, and rises to the surface.

Some such peculiar conjunction of favourable circumstances as the above is indispensable to the production of this remarkable phenomenon. Easy and simple of explanation though it be, it is believed, with good reason, that no similar appearance is to be found throughout the whole of Russia, although an island not very unlike it in character is said to exist in Holstein.

Whoever wishes to visit the spot should be careful to select the month of July, when he will be sure to find that the island has awoke from its winter sleep, and is already upon the surface. The sight which it will then be found to present is that of a large dark body, as it does not assume its verdant dress until a later period.



THE POSTAL TELEGRAPH SERVICE.



REAT development of the telegraphic business of the country has been felt since the acquisition of the telegraphs by the State, and the department has become a prominent institution. Some little account, therefore, of the manner in which this system is worked may be interesting.

The Central Telegraph Station is located in the new Post-office building, a vast structure, which has completely put its elder brother on the other side of the road out of countenance. On entering (says a recent visitor) a magnificent officer, all gorgeous in scarlet and gold, graciously condescends, on behalf of Her Majesty Queen Victoria, to examine our credentials, and to give us such directions as our benighted ignorance seems to him to require.

In a mysterious chamber beneath the entrance-hall is the "battery-room," where is generated the electric currents for which all the wires are so many pathways, and all the instruments in the rooms we are about to visit but so many contrivances for directing and controlling. It extends right across the basement, a silent and rather gloomy-looking chamber, fitted up with tiers of shelves, on which the "Daniel" batteries—merely small earthenware jars, containing acids and slips of metal—are ranged. There are 24,000 of these small jars, or "cells," as they are termed, and the shelves on which they stand are nearly three miles in length. The rooms would afford accommodation for nearly 40,000 "cells."

Passing in from the entrance-hall, we find ourselves in a spacious corridor extending all round the building, and com-

municating with similar corridors on the floors above by a noble staircase at each end of the pile. On our left hand are the different offices; on the right are windows looking into a small open quadrangle, in the centre of which is a chimney-stack towering up to the height of a hundred and thirty feet. Down in this quadrangle there are two steam-engines, designed chiefly for pumping water from an artesian well, which is at present unfinished, though it has already reached a depth of four hundred feet. This well is intended to supply hydrants for the extinction of fire all over the building, as well as to meet the requirements of the establishment in all other ways, including the supply of four large boilers beneath the engines, fed by "mechanical stokers." The loads of coal are shot from the street into bunkers underneath the building, and from these receptacles it is forced along a large tube by means of a screw, and so brought to the furnace mouths, where the mechanical firemen take it in hand, and so nicely adjust the supply to the requirements of the fire that scarcely any of it is allowed to escape in the wasteful form of smoke.

All this time we are laboriously climbing a broad stone staircase, winding by short flights round a central well, over which is a lantern, designed at once to afford a light to the staircase and thorough ventilation to one-half the entire building. If we had only been small enough we might have popped into one of the iron pneumatic tubes to be seen here and there about the corridors, and have shot up like a pea in a pea-shooter, or, more correctly perhaps, might have been sucked up just as water is sucked into a water squirt. On another page we give an account of this useful adjunct of the telegraphic service.

It is rather a bewildering place for a

stranger to find himself in. Imagine a floor which would require about a mile and a quarter of carpet a yard wide to cover it, and on which there is nearly a mile of tables, bristling with complicated instruments, some of them sending messages, some receiving messages, and some doing both at once. This "duplex telegraphy" is now an accomplished fact, and is regularly carried on in this room, a message being sent simultaneously from both ends of a single wire. It is reported that on the Madras railway telegraph even this has been surpassed, and a system of *quadruplex* telegraphy has been devised, two messages being sent in the same direction from each end of a line eighty miles long, and that the extension of the system to lines of greater length is simply a question of additional condensers and battery power. Our readers may perhaps be disposed to think that one message at a time is quite enough for the comprehension of ordinary mortals, and we will therefore turn our attention more particularly to the achievements of the most advanced of the single-message instruments. There is one near the door by which we have entered. This is a "Wheatstone Automatic," and as we come up to it is merrily chatting with some distant part of the country at the rate of 120 words a minute, or as fast as a tolerably rapid lecturer will speak.

The electricity, as we have seen, is generated in those earthenware "cells." From these, two wires extend, one leading down into the earth here in London, and the other running right away and connecting with the earth at Newcastle. These wires and the path form what is called a "circuit"—a pathway round which the electric current can freely circulate, and around which it *will* freely circulate unless interrupted. Along this road, however, are two turnpike gates—the transmitting instrument here in London, and the receiving instrument in Newcastle. The first is merely an apparatus for breaking up the current into little pieces, so to

speak—for breaking it into dots and dashes; and the second is an apparatus for making these little dots and dashes represent themselves on paper. If the "transmitter" be set working without a strip of paper, the electric current will flow through continuously. If a strip of paper without holes in it be passed through, the current will be entirely broken off; but if a perforated strip be passed through, the holes will form so many little vents through which the current will escape in sections, and will of course reach Newcastle in sections precisely corresponding.

There are a great many different kinds of instruments at work here, and amongst them is an instrument which, without any previous preparation of the telegram, will send, perhaps, thirty words a minute, so that in the same time four operators could send 120 words. By the first instrument it would also take three or four operators to send 120 words a minute, two or three to punch out the sentences, and one to transmit them. Notwithstanding this, there is an advantage in the instrument first noticed, because, although three or four persons would be required to keep up a speed of 120 words, only *one* wire would be requisite, while in this case it would take two wires, as well as two operators. This of course is a very important consideration, though, as "duplex" and "quadruplex" systems of telegraphy become developed, the cost of a line of wire will obviously become less in proportion to the work that can be performed by it. It seems possible, indeed, that even quadruplex telegraphy is by no means the final triumph of telegraphic science. While we write there comes the rumour of an invention, or rather discovery, which will entirely dispense with wires, and permit of signals being sent by the conductive power of the earth alone. What degree of truth there may be in the rumour we are unable to say, though it seems to have attracted some attention.

The "instrument galleries" may be roughly described as consisting of two long rooms united by a large square central

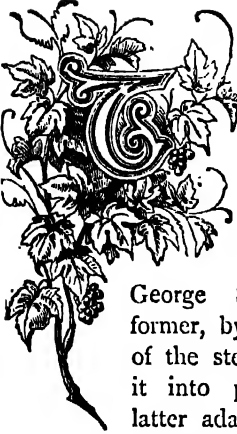
space, the whole forming one great apartment, the various parts of which are devoted to the different sections of the telegraphic service. Thus the central square is set apart for circuits extending into various parts of England and Wales; the north-east and south-east wings are for the suburbs of London; the north-west for Scotland and Ireland, and so on. In all these divisions together there are, during the busiest part of the day, nearly a thousand clerks employed, male and female, working together. Under no circumstances, it should be said, however, are females employed between 8 p.m. and 8 a.m. During the night there are 300 male clerks employed here, including a special staff for newspaper work, between 5 p.m. and 2 a.m. This news staff consists of operators selected from among the most rapid and experienced in the service. What amount of work they can achieve under pressure may be given in the words of a report of the Postmaster-General:—"On one occasion, when an important debate took place in Parliament, and when in addition there were an unusual number of interesting occurrences in different parts of the country, nearly 440,000 words—equal to about 220 columns of the *Times* newspaper—were transmitted from the central station in London in a single night."

To give an idea of the work which passes through this office, it may be stated that the total number of telegraph offices open at the end of the year 1876 was about 7,000, and the staff of officers engaged exclusively on telegraph duties numbered over 10,000 persons. We cannot conclude this paper without saying just a word in reference to that large body of the telegraph service, the telegraph messengers. These youths, when eligible, are drafted

into the postal department proper, as letter-carriers. They undergo a sort of military drill, and those belonging to the London district are drilled regularly. The organization of the force was carried out by Colonel Du Plat Taylor. It was very obvious that careful organization was required, and with this object in view Colonel Taylor aimed at subjecting the force of messengers to military regulations and drill. Thus there has been created the rank of "lance corporal," the messenger holding this position being, as a rule, one of superior age, and is placed in charge of a division of boy-messengers. That some such organisation was really necessary is to be inferred from the following humorous remarks of Mr. Scudamore upon the subject: "It would be of little use for the department to employ the best available means for carrying a message over a distance of 500 miles at the rate of forty words a minute, if when it left the wire it were to be delayed while the messenger played at marbles or jumped over posts. And, again, it is obviously of importance that special pains should be taken to make the messengers who, as boys, would of course rather be dirty than clean, keep themselves and their clothes in a creditable state." With a view to effect these objects a paper of instructions to the boys as to conduct and as to delivery was prepared by Colonel Taylor, and it has evidently had the desired effect. Mr. Scudamore states that although some of the messengers have been mischievous, and "have amused themselves by putting blacking into the tea of other boys, or by putting mice into the pneumatic tubes," still, as a whole, the force, considering their number and their youth, behave very well, and, indeed, much better than he expected.

GEORGE STEPHENSON,

THE RAILWAY PROJECTOR.



THE present gigantic system of railway communication is mainly owing to the efforts of two men—James Watt and George Stephenson. The former, by his improvements of the steam-engine, brought it into practical use; the latter adapted it to locomotive purposes. The result of their joint labours we see in the network of railways which intersects our land.

George Stephenson was born on June 9th, 1781. His father was a fireman at a coal-pit, where he had charge of a pumping engine. The cottage in which George first saw the light is situated about eight miles from Newcastle, in a village called Wylam. Like other colliery cottages, it was unplastered, had a clay floor, and was open to the rafters. "Old Bob," as Robert Stephenson was called, was much respected amongst his neighbours. His mother, too, was held in high esteem as a "rale canny body." "Old Bob" worked at the Wylam Colliery, and for his services he received the munificent sum of twelve shillings per week, upon which he had to keep the eight members of his family. Schooling for George and his brothers was therefore out of the question; but the father taught his children himself as well as he was able, and his lessons were never forgotten.

When George was about eight years of age, his father removed to another colliery at Dewley Burn, where he was engaged in shovelling in coal to a furnace which kept a steam-engine going. Here George himself was set to work. His first employment was to carry his father's dinner to him,

and to keep the children off the tramway which ran in front of the house. He was also left in charge of some cows, and was commissioned to close the gates after the wagons had passed through. For this he received twopence per day. The spare time which these occupations left him, he devoted to modelling engines in clay, and making imaginary steam-pipes from reeds. When he grew older he was set to lead the horses in ploughing and to hoe turnips at the advanced wages of fourpence a day. But at last he became a fireman, being appointed assistant to his father at Dewley. Here his duty consisted in attending to the furnace of one of those gigantic steam-engines which pumped water from a coal-pit. From Dewley he went to Mid Mill, and after that to the colliery of Throckley Bridge, at which his wages were twelve shillings a week. He felt he was getting on. It was a proud moment for him when one Saturday evening he got his first twelve shillings. "Now," said he enthusiastically, "I am a made man for life." His next rise was to the position of plugman, while his father worked under him as fireman. From looking after a furnace, he had now to attend to the working of a steam-engine, and to watch that the pumps were kept properly working. It was a post of responsibility, and not without trouble. If the pumps went wrong, he had to descend the pit, and do his best to rectify them by stuffing any hole or crevice to make them draw; and if the defect was beyond his power of remedy, his duty was to report it to the chief engineer. He was now in his element: could handle and scour, and work about among pistons, cylinders, wheels, levers, pumps, and other mechanical contrivances. About this period, too, he learned to read and write. In order to

increase his earnings he learned to make and mend the shoes of his fellow-workmen ; and his greatest triumph was when he had soled the shoes of his sweetheart and future wife, Fanny Henderson. He was so delighted with the capital job he made of them, that he carried them about to show his friends. His first guinea was saved from shoemaking, and his marriage to Fanny Henderson took place in 1802, when the pair betook themselves to Willington, about six miles from Newcastle. "Settling down as a married man, George continued to devote leisure hours to study or to some handicraft employment. From making and mending shoes, he proceeded to mend clocks, and became known among his neighbours as a wonderfully clever clock-doctor. It is said that he was led into this kind of employment by an accident. His chimney having caught fire, the neighbours in putting it out deluged the house with water, and damaged the eight-day clock. Handy at machinery, and wishing to save money, George determined to set the clock to rights. He took it to pieces, cleaned it, reorganized it, and made it go as well as ever. There was a triumph ! After this, he was often employed as a repairer of clocks, by which he added a little to his income." On 16th December, 1803, was born his only son Robert, who lived to be at the head of the railway engineering profession. As a brakesman, George had charge of the coal-lifting machinery at Willington, and subsequently at Killingworth. In 1804 he suffered a dreadful blow by the loss of his wife, while his son was still an infant. Three years afterwards his small savings were again swept away. He was drawn for the militia, and every shilling he had saved was paid away for a substitute. This was a dismal period in his life. Referring to it many years afterwards, he said, "Well do I remember the beginning of my career as an engineer, and the great perseverance that was required of me to get on. Not having served an apprenticeship, I had made up my mind to go to America, considering that no one in

England would trust me to act as an engineer. However, I was trusted in some small matters, and succeeded in giving satisfaction. Greater trusts were reposed in me, in which I also succeeded. Soon after, I commenced making the locomotive engine ; and the results of my perseverance you have this day witnessed."

In 1810 occurred George Stephenson's great opportunity. A steam-engine at Killingworth High Pit would not work ; one engineer after another tried to set it to rights, but failed ; and at last they were glad to let 'Geordie' try his hand, though they scarcely expected him to succeed. He took the engine to pieces, rearranged it skilfully, and set it to work in the most effectual manner. Besides receiving a present of £10 for this useful service, he was placed on the footing of a regular engineer, and afterwards consulted in cases of defective pumping apparatus.

By 1812 Stephenson had risen to the position of a colliery engineer and planner of machinery for working pits and wheeling off coal. Referring to this period, when in 1835 he gave evidence before a select committee of the House of Commons on accidents in mines, he said : "After making some improvements in the steam-engines above ground, I was requested by the manager of the colliery to go underground along with him to see if any improvements could be made in the mines by employing machinery as a substitute for manual labour and horse-power in bringing the coals out of the deeper workings of the mine. On my first going down the Killingworth pit, there was a steam-engine underground for the purpose of drawing water from a pit that was sunk at some distance from the first shaft. The Killingworth coal-field is considerably dislocated. After the colliery was opened, at a very short distance from the shaft they met with one of those dislocations, or dikes, as they are called. The coal was thrown down about forty yards [or abruptly lay at that much lower level]. Considerable time was spent in sinking another pit to this depth. And

on my going down to examine the work, I proposed making the engine, which had been erected some time previously, to draw the coals up an inclined plane, which descended immediately from the place where it was fixed. A considerable change was accordingly made in the mode of working the colliery, not only in applying the machinery, but employing putters instead of horses in bringing the coals from the hewers; and by those changes the number of horses in the pit was reduced from about 100 to 15 or 16. During the time I was engaged in making these important alterations, I went round the workings in the pit with the viewer almost every time that he went into the mine—not only at Killingworth, but at Mountmoor, Derwentcreek Southmoor, all which collieries belonged to Lord Ravensworth and his partners; and, the whole of the machinery in all these collieries was put under my charge." While at Killingworth, George went to Wylam, and saw the engines which were working on the tramway there. After seeing one at work, he said, he "could make a better one go upon legs." He saw at a glance its defects. "The furnace wanted draught, which he gave by sending the waste steam into the chimney; and at once by increased evolution of steam, the power of the engine was doubled or trebled. In 1815 he had a new locomotive at work, combining this and some minor improvements.

The locomotive engine was now fairly at work, but much had yet to be done before it was to arrive at the pitch of perfection at which we now witness it. The cost of working was considerable; the rails and machinery were not so highly finished as they now are, and the running was consequently rough. Step by step, however, all this ultimately was brought to pass. When the Stockton and Darlington Railway was projected, George offered his services to the directors, and was appointed engineer at a salary of £300 per annum. The work was all laid out by himself, and in some respects became a model for railway works—the gauge of four feet eight and a

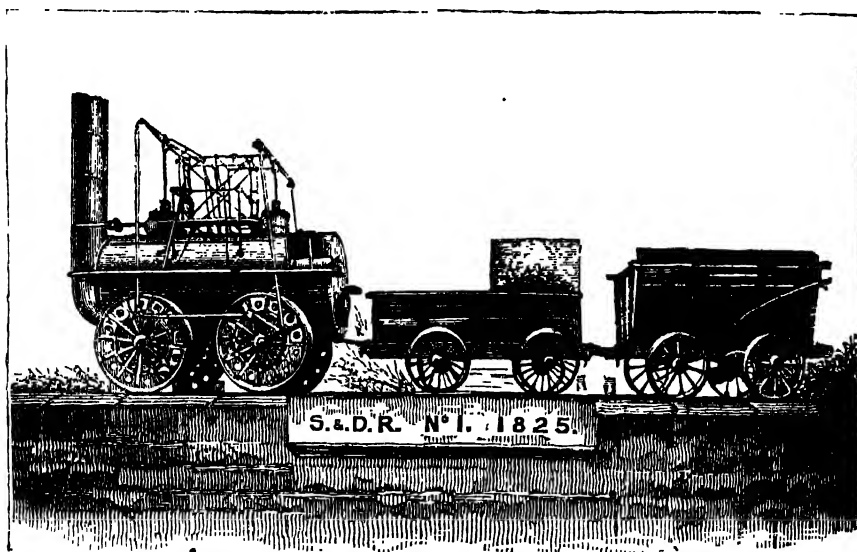
half inches, which is now usually followed, having here been adopted in a regular manner in imitation of the old tramways. A manufactory of engines was set up at Newcastle, in which Stephenson was a partner, and three locomotives were ordered from this establishment by the directors of the railway; for in their act of parliament they had taken power to employ steam in the traction of goods and passengers. The opening of this, the first public railway, took place on September 27th, 1825, in presence of an immense concourse of spectators. A local newspaper records the event as follows: "The signal being given, the engine started off with this immense train of carriages, and such was its velocity, that in some parts the speed was frequently twelve miles an hour; and at that time the number of passengers was counted to be 450, which, together with the coals, merchandise, and carriages, would amount to near ninety tons. The engine, with its load, arrived at Darlington, a distance of eight and three-quarter miles, in sixty-five minutes. The six wagons loaded with coals, intended for Darlington, were then left behind; and obtaining a fresh supply of water, and arranging the procession to accommodate a band of music and numerous passengers from Darlington, the engine set off again, and arrived at Stockton in three hours and seven minutes, including stoppages, the distance being nearly twelve miles."

The drawing of about 600 passengers, as there appear to have been in the train, at the rate of four miles an hour, was thought very marvellous. "A month later, a regular passenger-coach, called the *Experiment*, was placed on the line; it was drawn by a horse in two hours. The haulage of coal only was effected by the locomotive. It was evident that the making of engines was still in its infancy. Stephenson, at his manufactory, continued to carry out improvements, in which he was assisted by his son on his return from South America in 1827."

The next important work which George undertook was the surveying of the Man-

chester and Liverpool Railway. This was a work of considerable difficulty, owing to the opposition of the landowners. But the survey was made. In support of the bill, he had to attend as a witness before the committee of the House of Commons, where his assertion that it would not be difficult to make a locomotive travel fifteen or even twenty miles an hour, provoked one of the members to reply, that the engineer could only be fit for a lunatic asylum. In face of the opposition it was deemed desirable to withdraw the bill; but the directors ordered a fresh survey, and the

bill this time passed. George received the appointment of chief engineer of the works, at a salary of £1000 per annum. His great difficulty was Chat Moss, but this was ultimately completed, to the astonishment of the most eminent engineers. During the progress of the work the directors offered a prize of £500 for the best locomotive to go at the rate of ten miles an hour! Stephenson determined to compete, and built an engine called the "Rocket" for the purpose. The trial came off on October 8th, 1829, when three engines were brought forward: Stephenson's "Rocket,"



GEORGE STEPHENSON'S "LOCOMOTION."
At Darlington.

Hackworth's "Sanspareil," and Braithwaite and Ericson's "Novelty." The test assigned was to run a distance of thirty miles at not less than ten miles an hour, backwards and forwards along a two-mile level near Rainhill, with a load three times the weight of the engine. The "Novelty," after running twice along the level, was disabled by failure of the boiler-plates, and withdrawn. The "Sanspareil," traversed eight times at a speed of nearly fifteen miles an hour, when it was stopped by derangement of the machinery. The "Rocket"

was the only one to stand the test and satisfy the conditions. It travelled over the stipulated thirty miles in two hours and seven minutes nearly, with a speed, at times, of twenty-nine miles an hour, and at the lowest nearly twelve; in the latter case exceeding the advertised maximum; in the former tripling it. The prize was at once awarded to the makers of the "Rocket." "This engine," as is well remarked, "was not only remarkable for its speed, but also for the contrivances by which that speed was attained. Most im-

portant among them was the introduction of tubes passing from end to end of the boiler, by means of which so great an additional surface was exposed to the radiant heat of the fire, that steam was generated much more rapidly, and a higher temperature maintained, at a smaller expenditure of fuel than usual. The tubular boiler was indeed the grand fact of the experiment. Without tubes, steam could never have been produced with the rapidity and heat essential to quick locomotion." In more senses than one, the trial of the three locomotives, in October, 1829, marks an epoch. By burning coke instead of coal, the stipulated suppression of smoke was effected; the quantity consumed by the "Rocket" during the experiment was half a ton. The coke and water were carried in a tender attached to the engine.

At last, on September 15th, 1830, the Liverpool and Manchester Railway was opened. Great public excitement was caused by this event; several members of the Government, and distinguished individuals from various quarters, were invited to be present at the opening. On the memorable day, a train was formed of eight locomotives and twenty-eight carriages, in which were seated the eminent visitors and other persons present on the occasion, to the number of 600. The "Northumbrian," one of the most powerful of the engines, took the lead, and business commenced regularly the next day. The opening was clouded by a sad accident, by which the Prime Minister, Mr. Huskisson, lost his life. "Of the thirty stage coaches which had plied between the two towns, all but one went off the road very soon after the opening, and their 500 passengers multiplied at once into 1000. In December commenced the transport of goods and merchandise, when a loaded train weighing eighty tons was drawn by the 'Planet' at from twelve to sixteen miles an hour. In February, 1831, the 'Samson' accomplished a greater feat, having conveyed

164½ tons from Liverpool to Manchester in two hours and a half, including stoppages, as much work as could have been accomplished by seventy horses." This line now forms part of the London and North-Western Railway.

With the assistance of his son, Stephenson further perfected the locomotive, which he lived to see running at forty miles an hour. In 1849 he retired from active life to a residence near Chesterfield, called Tapton Hall, with the intention of enjoying that love of nature which he always manifested. "At home, in the close of his days, George Stephenson occupied himself with his birds and other animals, for which he had a great fondness; nor did he take less pleasure in his garden and the rearing of flowers and vegetables. Occasionally, he visited the scenes of his youth among the collieries about Newcastle, at all times taking an interest in the welfare of the workmen, and never feeling ashamed of recognising old acquaintances. Though often invited to the houses of persons of distinction, he acknowledged he had no wish to figure in what he called fine company. It is said that he was beset by projectors of all kinds for the sake of his advice; and that the young likewise besought his counsel as to their proposed professional career, which he gave always cheerfully, except when these youthful aspirants were affectedly dressed, and put on airs contrary to George's notions of propriety." To a young applicant of this stamp his candour was probably not very agreeable, but may have been salutary: "I hope you will excuse me; I am a plain-spoken person, and I am sorry to see a nice-looking and rather clever young man like you disfigured with that fine-patterned waistcoat, and all these chains and fangdangs. If I, sir, had bothered my head with such things when at your age, I should not have been where I am now."

George Stephenson closed his useful career August, 12th, 1848.

THE PEARL FISHERY.



IN his account of Ceylon, Mr. Perceval says, "There is no spectacle the island affords more striking to a European than the Bay of Condatchy during the season of the pearl fishery. This desert and barren spot is at that time converted into a scene which exceeds in novelty and variety almost anything I ever witnessed—several thousands of people of different colours, countries, castes, and occupations, continually passing and re-passing in a busy crowd; the vast numbers of small tents and huts erected on the shore, with the bazaar or market-place before each; the multitude of boats returning in the afternoon from the pearl-banks, some of them laden with riches; the anxious, expectant countenances of the boat-owners while the boats are approaching the shore, and the eagerness and avidity with which they run to them when arrived, in hopes of a rich cargo; the vast number of jewellers, brokers, merchants, of all colours and all descriptions, both natives and foreigners, who are occupied in some way or other with the pearls, some separating and assorting them, others weighing and ascertaining their number and value, while others are hawking them about, or drilling and boring them for future use: all these circumstances tend to impress the mind with the value and importance of that object which can of itself create this scene."

•The principal oyster-bank is situated opposite Condatchy, and is about twenty miles from the shore; and the best fishing is said to be found in from six to eight fathoms water. There are fourteen banks, but not all equally productive; and before the fishing commences, these banks are surveyed. The state of the oysters is thus

ascertained, and a report is then made to Government. If it is found that the quantity is sufficient, and that the oysters have arrived at a proper degree of maturity, the particular banks to be fished that year are put up for sale to the highest bidder, or are kept in the hands of Government, to be fished on its own account. The pearl-oyster, it may be stated, is supposed to reach its maturity in about from seven to nine years; and it is said that after that period the pearl becomes disagreeably large to the fish, and is then vomited out of the shell. The Dutch, with inconsiderate avarice, had nearly exhausted the banks; but since the island of Ceylon has come into our hands, a different policy has been adopted, to prevent such an accident happening again. The banks are divided into several portions, and not more than two or three can be fished in one season. These different portions are leased annually in succession, so that now a sufficient time is given for the oysters to increase in size and numbers. Moreover, the period during which the fishing is permitted to be carried on is only about six weeks or two months at the most, commencing in February, and ending about the beginning of April; and so numerous are the holidays amongst the divers that the number of fishing-days in each season seldom exceeds thirty. During the season, the boats regularly sail and return together. A signal-gun is fired at the station Arippe about ten at night, when the whole fleet sets sail with the land-breeze. They reach the banks before daybreak, and at sunrise they commence fishing. In this they continue busily occupied till about noon, when the sea-breeze sets in, and warns them to return. When the boats come in sight, another gun is fired, and the colours hoisted, to give notice to the anxious owners of their arrival. The cargoes are taken out immediately the boats arrive, so as to be completely unloaded before night sets in.



Each boat carries twenty men, with a pilot. Ten of these men are rowers, and also assist the divers in ascending; and the other ten are divers. Those from Colang, a small place on the Malabar coast, are reckoned the most expert, and are only rivalled by the Lubbahs, who remain in the island of Manaar for the purpose of being trained. These divers go down five at a time alternately, thus giving each other time to recruit. Accustomed to this trade from their infancy, these men fearlessly descend to the bottom in from four to ten fathoms water; and to accelerate their descent, they use a large stone. Five of these are brought in each boat, composed of red granite, of a pyramidal shape, round at top and bottom, and having the smaller end perforated with a hole, so as to admit a rope.

When about to plunge, the diver seizes the rope to which the stone is attached with the toes of his right foot, taking a bag made of network with his left. Accustomed to make use of his toes to work with and to hold by, the Indian can pick up articles with them almost as well as a European can with his fingers. He then seizes hold of another rope with his right hand, and, holding his nostrils shut with his left, plunges to the bottom. He there contrives to hang his net around his neck, and with much dexterity and despatch collects as many oysters as he can while he is able to remain under water; then pulling the rope, which he continues to hold in his right hand, he gives the signal to his comrades in the boat, who draw him up with his cargo, the large stone which he carried down being left behind, to be drawn up by the rope attached to it. The oysters are sometimes found, according to Sir Alexander Johnston, in what are called cables or ropes, of which a good diver is immediately sensible, and coils the whole into his net without breaking it. At such times, or when the ground is well clothed with them, the diver will bring up one hundred and fifty shells at a dip.

The exertion undergone during this process is so violent that upon being brought into the boat, the divers discharge water from the mouth, ears, and nostrils, and frequently even blood. This does not, however, prevent them going down again; and they will often make from forty to fifty plunges in a day. Some rub their bodies with oil, and stuff their ears and nostrils, to prevent the water from entering, while others use no precautions whatever. The time the divers can remain under water, at the depth of seven fathoms, seldom exceeds one minute, sometimes one and a half, though they are occasionally known to remain about two. Mr. Perceval asserts that there are instances known of divers who could even remain four or five minutes, which was the case, he says, of a Caffre boy, the last year he visited the fishery. The longest instance ever known, he adds, was a diver who came from Arjango, who remained under water absolutely full six minutes; and Mr. Morier, in his "Journey through Persia," asserts that the divers at Bahrein can remain five minutes under water. They seldom live to a great age; their bodies break out in sores, and their eyes become very weak and bloodshot. Indeed, they often die from over-exertion, being struck down on arriving at the surface as if by a shock of apoplexy. It is recorded of one that he died immediately after he had reached land, having brought with him, amongst other shells, one that contained a pearl of surprising size and lustre.

The danger, however, which the divers dread most arises from the chance of their falling in with the ground-shark, a terrible creature, which prowls near the bottom, and proves a source of perpetual uneasiness to the adventurous pearl-fisher.

The island of Bahrein, in the Persian Gulf, also supplies a large number of pearls; and the fisheries in the Gulf of Panama and on the coast of California are still carried on, though they are not so productive as formerly.

THE

DUNGEONS OF THE BLACK FOREST.

IN proximity to the wild scenery of the Black Forest stands the modern, elegant, and brilliant town of Baden-Baden. I have no intention of inflicting a description of the Kursaal, the promenades, the Conversations Haus, the hotels, the gaming-tables, and the scamps, these two last being the bane of all the German watering-places. But I ask the reader to accompany me across the little river Oos, and to climb the steep streets of the town that lead towards the pine forests.

Baden, I believe, has always had *in* it or *over* it the castellated abode of the lords of the duchy; and their earliest residence, the Alte Schloss, as it is called, built in some long-past period of what are called "the good old times," is now a picturesque ruin, thanks to the destroying hand of the French soldiers, who in the wars of the Palatinate spread devastation all over the plain of the Rhine. Some two miles above the town, it is a good climb; and if on a warm day you are not tempted to sit down on a bank of moss, inhaling at your leisure the perfume peculiar to a pine forest, and listening to the music which the breezes make among the slender boughs, you have not as keen an appreciation of nature's charms as I have.

If I were writing an account of Baden, I would try to give you some idea of the magnificent panorama that spreads itself before the gaze from these ruins; but I only mention them at all to introduce you to the "Neue Schloss," the castle which was built on the destruction of the old one, and which is much lower down the hill, and, indeed, barely outside the town. It is, comparatively speaking, a modern erection, having been built, if I remember rightly, somewhere about the year 1689; and ex-

ternally there is but little to excite attention. It is a solemn, heavy-looking building, and its smooth face, and the apparent absence of means of defence, detract from its castellated appearance, and give it an air of innocence which in reality it has no business to wear: at least such were our first thoughts; but a little closer inspection showed us that it was not so devoid of battlements and other warlike appliances as we had thought. All the rooms are freely shown to visitors, in the absence of the duke and his retinue, and we saw in them much fine furniture and a goodly array of portraits of former lords of the duchy. We saw, too, the room in which the assemblage of crowned heads met, some years ago, for the Baden-Baden conferences, when Savoy and Nice were quietly handed over to Louis Napoleon and France.

This was all well enough, yet not quite what I wanted, for I knew that other and more soul-stirring scenes had been enacted within these walls in "the good old times"; and, turning to our guide, I said,—

"But are you not going to show us the dungeons?"

"Oh yes, we should see the dungeons;" and, taking us out at the front door, he led the way to a tower which adjoins, and, indeed, forms one corner of the building.

Originally there was no entrance to this tower from the outside, and the door through which we passed had been made in later years. If tradition is to be believed, the unhappy prisoners who were destined to the dungeons below were brought into the main building blindfolded, placed in a chair, and drawn to the top of the building up one side of a narrow shaft (which still exists) communicating with the dungeons below, and then lowered down the other side.

After some little descent from the door

whereby we of modern days approach these dungeons, a room is reached where the guide lights lanterns and candles; and then daylight is left behind. Dark were the deeds enacted within those cells, hewn out of the solid rock far beneath the surface of the earth; and as we stood in that which is said to have been the torture chamber, and looked upon the iron rings still fixed in the wall, it was fearful to think that many a frame of manly strength, ay, and doubtless of womanly beauty too, had been torn and tortured within the few square feet of that little cell. Heaven's sunlight never entered there. Scarcely can we believe that they were human beings who could have listened to the screams of agony with which those grim stone walls must have resounded, and yet have steadily continued the torture their devilish engines and unearthly cruelty enabled them to inflict.

Standing there in the dim, flickering light of the lanterns, which just served to make the gloom more gloomy, our guide slowly and laboriously shut the massive stone door—a slab some twelve inches thick, and weighing from 1,500 to 2,000 pounds. Slowly it yielded to his pressure, groaning on its now unused hinges; and never shall I forget the thrill of horror which seized me as, with a sound betwixt a sigh and a groan, it went "home," and only needed the iron bars outside to be adjusted to set at defiance all attempts at escape.

Never have I had so vivid a realization of utter despair as, with that sound in my ears, and that sight before me, I thought of the poor prisoner listening to the echo of the retreating footsteps of those who had shut him in, and of the frenzy that must have seized him at the awful silence around, and the consciousness, that he was utterly beyond human help.

But this is not all. Of the seven or eight dungeons, the largest was the hall

of judgment; and the remains of the stone benches, on which those who called themselves judges sat, and the subterranean passage by which they entered, still exist, although the latter is choked up. It is most unlikely that any of the unhappy creatures who had been immured in these dungeons, and had been there tortured, were ever permitted to see the sun again, or to tell their tale of horror to mothers and fathers, husbands and wives. But be this as it may, when judges and gaolers had done their pleasure upon all that was mortal of their victims, they sent their souls to the great account in a method strangely cruel—a method worthy of a Spanish Inquisition in the darkest days of Rome's tyranny. The doom of the condemned one was concealed from him; and, after being informed that he was to be set at liberty, he was bidden to kiss an image of the Virgin in a corner of the dungeon, and thank her for his deliverance. But before he reached the image, he crossed a trap-door, which, giving way beneath him, precipitated him down another shaft. The fatal pit with its trap-door was called an *oubliette*, because those who were precipitated down it were *oubliés*—never heard of more.

But what was contained in the darkness of that abyss remained unknown until more modern days. A pet dog once fell down, and an attempt was made to ascertain what had become of him. An investigation showed that the pit was many yards deep; and the explorers found there "fragments of ponderous wheels, set round with rusty knives, with portions of bones, rags, and torn garments, adhering to them." Tradition says that the unhappy prisoner fell upon a machine composed of many wheels, armed with lancets and teeth, and previously set in motion.

But let us leave these gloomy chasms, all so silent now, yet haunted with terrible and heartrending memories.



A WONDERFUL BREAKWATER.

ENGLAND'S south-western coast is beset with perils, and no part was once more dangerous than Plymouth Sound. The old people of that town tell fearful stories of shipwrecks which occurred when they were young, or tales which were told them by their fathers. The Plymouth churchyards and burial grounds are full of memorials of sailors drowned within sight of home.

The dangerous nature of the anchorage in the Sound long ago attracted the attention of the Government, and as early as 1788 a plan was proposed for rendering it secure. In 1811, the great engineer Rennie, in conjunction with Mr. Whidbey, proposed a mole, or breakwater, to run across the middle of the Sound, leaving a channel for ships to pass at each end. It was determined to build the breakwater of blocks hewed from the limestone quarries of Oreston, in Catwater, which were purchased by the Government from the Duke of Bedford for £10,000. The time of its erection was to be six years, and its expense about a million. Both these items, as is well known, were greatly exceeded.

The Prince Regent's birthday, the 12th of August, 1812, was fixed for the commencement of this undertaking. From the quarries, which had been opened on the 7th, a vessel brought to the spot a gigantic stone, of several tons' weight, and, plunging it into the sea, laid the foundation of this novel structure. Stones continued to be brought day after day to be discharged upon the spot, the outline of the breakwater being marked by two tiers of buoys. Of course it was a long while before the stones had become so piled as to appear above water-mark. Till then vessels of peculiar construction brought their lime-

stone cargoes and shot them out. They had sterns very high and very wide, containing two large ports, side by side, the doors of which when lowered formed inclined planes. In at these doors ran trucks containing stones from the quarry, and they moved along iron railways fixed in the hold. Sixteen trucks could thus be accommodated in this way. There were also railways for the deck, which could in some cases carry six or eight of these loaded wagons. The ports were closed, and away went the stone-burthened ships to the line of buoys. Then after the vessel had anchored between the lines the stern ports were opened, the trucks, one after another, were run out to the edge, the stone was canted into the water, and the empty vehicle hoisted up to the vessel deck, ready to be run out at the quarry quay for reloading. Forty or fifty minutes sufficed for the discharge of one of these cargoes. In a single week as many as 15,379 tons of stone have been thrown into the deep to contribute to this ever-growing breakwater. On the 31st of March, 1813, to the joy of all concerned, the corners of the stones were seen peeping above the surface when the tide ran out. The blocks now soon began to prevent the vessels from discharging their cargo as they had done. So a new plan was adopted. A very strong mast was placed in a vessel, and a boom, or sheer, fixed to it, whence it was called a sheer vessel. The boom, or sheer, formed a sort of crane, projecting far beyond the vessel's side, so that by this means stones were raised out of the hold and swung into their proper place upon the surface of the spreading heap. When the work had been brought as high as was necessary blocks as square and as even as possible were fixed on the top for persons to walk upon.

When the men had been toiling at the construction of this monster mole for about

five years there came to try its strength one of those tremendous "sou' westers" against the rage of which it was intended to be a defence. On the 9th of January, 1817, it blew a hurricane, which raised the sea six feet above its usual height at spring tides. The breakwater was found to be no small defence. A sloop of war and a schooner without its shelter "were driven to the head of the Sound and lost; while a deeply laden collier, anchored within, rode out the gale in safety." The shipping in the Catwater too escaped, though it was considered that but for the assistance of the friendly mole they must have sustained immense damage. The storhouses and buildings on the margin of the water were also preserved, which but for the same defence must, doubtless, have been swept away.

But the blows of Neptune were found, after this battle of the elements was over, to have left some pretty deep indentations on the breakwater. A mass of stones, 200 yards in length and 30 in breadth, was dislodged and completely rolled over. But though the power of the waves here beat the art of man in the then existing stage of its progress, that art was able, in the course of time, to repair the damage; and the work continued to advance and prosper; but in 1824 another testing hurricane occurred in the month of November, surpassing in violence the former one—a hurricane still remembered with terror by many of our sailors on the southern coast. Again the mighty breastwork of limestone repelled the beating waves, and probably saved the lower part of Plymouth from utter demolition, for now the tide rose seven or eight feet above its usual highest mark. In proportion to the increased power and peril of this storm was the damage done to the breakwater: 785 yards, or one half of the work then finished, had been torn up; and blocks from three to ten tons in weight had been loosened and torn about in the hands of the wild spirit of the storm. Nearly 200,000 tons were lifted up and moved from their position during that awful storm.

The injury done to the breakwater was attributable to an error in its construction, which experience now taught its architects to repair. The crevices between the rough blocks had been left open; consequently, they were filled with air; and so when the billows came curling over them they compressed the air, which served as a wedge to loosen the stones. To obviate this danger in future, it was determined to occupy the interstices with rubble, and thus to form one compact mass, into which no water could penetrate. The fall of the slope on either side was also decreased to five feet horizontal for one perpendicular; and large blocks of granite, cut and dovetailed, were used at the base and at first were fixed in a leives, or plate of iron, one end of which was lodged in the stone beneath, with an eye at the top, through which a bolt, three inches in diameter, passed into each stone, thus linking the whole together; but this plan was afterwards discontinued, because the iron was found to swell with rust and to burst the stones in which it was lodged.

The work was finally completed in 1848, when the total quantity of rubble deposited had amounted to 3,670,444 tons, besides 22,149 cubic yards of masonry, or an amount of material at least equal to that contained in the Great Pyramid. The whole cost of this magnificent work was about a million and a half sterling. The whole length of the breakwater is 1,700 yards, of which the centre embraces 1,000. The breadth of the top is 45 feet, of the inner slope 110, and of the outer 105. The whole width of the base of this mighty structure is 410½ feet, more than the whole extent of St. Paul's Cathedral from east to west. At the western extremity is a lighthouse.

This vastly useful breakwater has now constituted the Sound a capacious harbour, wherein fifty ships of the line, besides frigates and smaller vessels, can at all times find safe anchorage. Above 200 sail have at one time taken refuge within it.



A JAPANESE WATER PICNIC.

TRAVELLING IN JAPAN.



THE mode of conveyance is usually a jinrikisha, a thing like a perambulator on two wheels, which is drawn by either one or two men. One feels funny at first in them, but soon gets used to them. They go along at a good pace—about six miles an hour—the coolies trotting along at a run the whole way. They are wonderful runners, as I am told that some of them will do a hundred miles in a day with their jinrikisha. They are very small men, but have tremendously muscular legs, which, by the bye, one sees a good deal of, as they are not over-burdened with clothing. They usually wear straw sandals, kept on by a thong that passes between the great and fourth toe to the sides of the sandals, and is tied round the ankle. The only danger is, that in going down hill they may get overpowered with the weight of a big man—in which case, I am told, they slip out of the way, and let one go. However, I have not come to grief yet myself. They live almost entirely on rice and fish, with eggs occasionally. I see a good many of them with varicose veins, and I am told that they don't last long; though I should think that there cannot be much foundation for this statement.

The norimon, a kind of palanquin in which travellers both male and female are carried, is constructed on a principle only adapted for a people whose ideas of repose and comfort are utterly at variance with our own.

Our sisters in Japan, when fatigued by moving about, sit down on their heels in an attitude suggestive of cramps and stiffness, and appear to be as well rested by remaining in that position as we are by sitting on a chair or reclining on a sofa; and so they

submit to be packed for hours in a sort of lacquered cage, which is suspended from a strong pole borne on men's shoulders. Two bearers go in front, and two behind. The norimon only clears the ground by about one foot.

In cold and wet weather the bearers are dressed in a long cotton tunic, which they tuck up under their waistband when they are carrying an important personage, in order that the limbs may be moved freely. The badge of their master is stamped or embroidered on the shoulders and back; but in summer even this garment is dispensed with. They carry the norimon with its live freight at the rate of about three miles an hour; the movement is very unpleasant, and tiring to those unaccustomed to this kind of locomotion. There is an opening at the side; but it is almost impossible to look out of it without straining one's neck, so that one is conveyed across the country very much like a bale of goods, and can only catch an occasional glimpse of the passing scenery. A large number of bearers are always taken on long journeys, in order to serve as relays.

Japanese women are never seen on horse-back. In crossing a stream, ladies sit on a light kind of platform, which is carried across on men's shoulders. Women of the humbler classes, who are unable to pay for this accommodation, frequently sit on the stalwart porters' shoulders.

The rugged paths along the steep mountain sides, and the uneven character of this hilly and volcanic country, render a norimon-bearer's life a hard one. They must ford the numerous shallow streams, toil up the rocky paths, often merely the dry beds of mountain torrents, and carry the norimon and its contents for many a weary mile. Even in the towns the labour is not slight, for high flights of stone stairs are often necessary in the streets, in order to facilitate locomotion. Up and down, up and down

these out-of-door staircases the bearers and their burdens must go. It is no unusual thing in some of the southern cities for a temple to be approached by flights of granite steps, numbering a hundred or a

hundred and forty, and up these the norimons frequently pass when conveying Japanese ladies to their devotions.

The little wiry ponies, also, can run up these staircases almost as safely as cats.



TRAVELLING IN JAPAN.

They are spirited and somewhat vicious animals, tolerably easy to ride, but always snapping and biting at each other. It is a Japanese custom to shoe them with straw

shoes, which of course are rapidly worn out; they are then left on the roadside and a fresh pair tied on. A supply is usually attached to the saddle.



ADVENTURES OF BANK-NOTES.

VERY curious occasionally is the fate of bank-notes. It is not at all an unusual circumstance for a mutilated note to be presented for payment, burnt perhaps half through, with the marks of burning on the fringes. Nor is the mutilation always accidental. The men who indulge in the luxury of lighting their cigars with a bank-note are not the millionaires or acknowledged lunatics of society. They are presented generally by workmen or labourers, who confess without hesitation that they have "lit their pipes" with them, from braggadocio, or when drunk. The Scotch banks in such cases enforce the wholesome rule of paying only in proportion to the size of the remnant of the note so presented; that is to say (unless there is clear evidence that the mutilation is purely accidental), if half of a one pound note is presented, the bank only pays ten shillings for it, on the perfectly fair plea that, for all they know to the contrary, the remaining half, or third, may be presented at a future time by a second person.

A farm labourer one day presented a rag of grey paper, crumpled and pulpy, the type hardly legible, which he said was a bank-note. His explanation was that a pet goat in his kitchen had got hold of it and eaten it. The note had been in the animal's stomach some time before it was missed, and was only suspected to be there because one of his girls had seen Nanny "mumblin' over" a bit of grey paper. There had been a serious domestic difference of opinion and mental struggle in deciding whether the note, if swallowed, should be sacrificed in order that the goat might live, or whether it would be wiser to sacrifice the pet on the chance of recovering the money. The struggle between sentiment and "siller"

had ended unfavourably for the goat, and, after all, the "promise to pay," extracted from so strange a hiding-place, was so chewed and mangled that the poor man was kept in suspense for some time as to whether he might not lose both his money and his pet. But his story was ultimately believed, and he went away comforted.

Bank-notes in rural districts are sometimes in the hands of the public for years before they are presented for payment. In Scotland, at least, where gold is by the poorer classes invariably looked upon with suspicion, well examined, rung, bent, and bitten, before accepted, and, when accepted, generally exchanged at the first opportunity for paper, the profits falling to the banks arising from the issue of notes, it need hardly be stated, are large. I shall not readily forget the tragic look of despair that fell on the features of an old woman who once at a branch bank produced with trembling hand from a stocking, which she confessed had been hidden in a "dry dyke" for more than a quarter of a century, a small bundle of tattered notes which she wished to deposit in the bank. She explained that she did so because of some robbery that had taken place near her cottage, and because some neighbour had given her a hint that interest was allowed for money lodged. On producing her notes, dating back nearly half a century, she was told that the bank which issued them had ceased to exist for upwards of ten years. If the foundations of the earth had suddenly moved from under her, she could hardly have looked more terror-stricken. But it happened that the business of the defunct bank had been taken over by a flourishing surviving one, which, when the notes were sent to it for inspection, paid the amount in full, to the infinite relief of the old lady, whose stings and scrapings and sacrifices of a lifetime were not lost at a stroke, as she at first feared.

Innumerable are the stories of narrow escapes of money lost by stoppage of payment of banks, and the clever, if unscrupulous, way in which men holding notes of the bankrupt bank manage to get rid of them. As, for instance, is that of the surly old banker who fell a victim to the one-sided view of the proverb of the early bird being most likely to secure the worm. He prided himself on his punctuality, and was in the habit of reaching his office before his clerks were strictly due, in order to enjoy the pleasure of taunting them for their unbusiness-like propensity of delaying attendance on their duties to the last legitimate moment. It is recorded that on one occasion, as he was entering his office half an hour before business began, a stranger accosted him on the step of the door of the bank, in great haste, saying,—

"Banker, the coach is about to start. If I wait until your bank opens, I shall miss it. I want change for a £20 note, and must have it."

The astute banker put difficulties in the way. His safe was not open. Business did not begin until ten o'clock. It was irregular to transact business before banking hours. In a word, he would require to charge a commission on the transaction. The stranger, not to miss his coach, as he put it, was willing to pay any reasonable commission, and, finally, exchanged the note, being charged ten shillings for the accommodation. On the arrival of the clerks at the proper hour, the banker, in order to point a moral on the virtues of

punctuality, early rising, devotion to business, and such like, related the profitable transaction; but on opening his letters when business really began, found to his chagrin that the bank which had issued the note he had cashed to the stranger had stopped payment on the previous afternoon!

Considering the vast sums that pass from the hands of bankers to men who are less or more strangers, it is amazing that cases of misappropriation of money are not more frequent. Despite the greatest caution the risk is undoubtedly great. Bankers do not so often fall victims to forgery now-a-days as to the trick played by the light-fingered gentry of altering a figure in a carelessly-written cheque to a larger amount. For instance, by simply adding a cypher after the figure 8 in the margin of a cheque, and the letter "y" to the word "eight" in the body of a cheque, the total amount is converted into a legible eighty that defies detection by the most experienced eye. American bankers are much more careful in demanding identification before making payments than we are in England. A well-known English baronet and M.P. startled a cashier on being asked, when he presented a circular-note for payment in a town through which he was passing, by what means he could be identified. "Well, I don't know. I know no one here. But if you like to show me into your consulting room, I will let you see the tail of my shirt, on which you will find my name written!" Whether the test was accepted or not, history does not say.

PICKLED PORK.



CINCINNATI calls itself the "Queen City of the West," but is often named "Porkopolis," being a great centre of the pork-curing business. It is the largest inland city of the States, and its manu-

factures embrace foundries, ironworks, tanneries, soap-works. The great pork-curing establishments are at Covington, on the southern side of the river. Here piggy is converted into pork before he has time to squeak. The hogs are reared in the

country around on the refuse of the corn-fields after harvest, and among the extensive forests, where they pick up food at little or no cost to their owners. Brought in steamers from a great distance, they are seen marching and grunting in large herds through the streets to the slaughtering establishments in the neighbourhood. The season in which they begin to make their appearance is the autumn, when they are in prime condition, and when, from the state of the temperature, their carcasses can soon be cooled by the air, and rendered fit for pickling. The greater number of the hog slaughter-houses is behind the town, on the road towards the higher grounds; and they are generally wooden or brick structures of a very plain description. Each is provided with a series of pens, whence the animals walk in single file along an enclosed gallery towards the apartment where they meet their doom.

When a pig is killed in England, the sufferer usually takes care to let the whole neighbourhood hear of the transaction. On such occasions, it is the prescriptive right of the pig to squeak, and he is allowed to squeak accordingly. In Cincinnati there is no time for this. Driven along the passage from the exterior pen, each hog on entering the chamber of death receives a blow with a mallet on the forehead, which deprives him of consciousness and motion. The next instant he is bled to death; and by means of an extensive system of cauldrons and other requisites, the carcass is speedily cleaned, dressed, and hung up to undergo the proper cooling, previous to being cut in pieces and pickled.

The largest of these establishments is situated in Covington, on the opposite side of the Ohio, and consists of a series of brick buildings, which cover nearly two acres. Here an inclined plane leads from the ground to the top of a house four storeys high, and along this the hogs are driven to an upper floor to be slaughtered, and where as many as 4,000 can be accommodated at a time.

"In this establishment," says Mr. Macrae, "you may see, almost incessantly at the busy season, a stream of pigs pouring in along a gangway, little imagining what awaits them. Every pig, the instant it gets within the building, receives a stunning blow, is clutched by the snout, stuck, run by machinery up to the top of the building, plunged into a long tank of hot water, shot from hand to hand and scraped, hooked up and run on by machinery, ripped down, cut into parts, dressed and salted, and all this with such rapidity that within twelve minutes from the time when it was an intelligent pig on the gangway, it is converted into pork, packed in barrels, and ready for shipment. They tell about an ingenious Yankee inventing a machine, which was warranted, when wound up and set in motion, to chase a pig over a ten-acre lot, chop him into sausages, work his bristles into shoebrushes, and manufacture his tail into a cork-screw!"

In most cases, the business of curing pork is separate from that of slaughtering; but here they are united: and the arrangements for cutting up, pickling, barreling, and branding, are all on a vast scale. An idea of the work gone through is obtained from the single fact that the pickling takes place by steeping in a number of immense brick-built tanks, each of which holds 400 barrels of pork.

The number of pigs killed in some of these buildings is fabulous. A traveller who visited Chicago a few years since says, "One of the two establishments I saw kills 70,000 pigs per annum, besides myriads of sheep, which during the busy season in autumn are slaughtered at the rate of 2,000 a day. In that single year there were killed and packed in Chicago 26,000 cattle and 670,000 hogs, reaching about four times the weight of her population." Since that time this quantity has increased year by year. During the season—that is, from the 1st of September to Christmas Day—at least 930,000 hogs pass the necessary stages from live pigs to pork!

THE LEOPARD.



HE Leopard (*Felis leopardus*) is a native of Asia and Africa. It much resembles the tiger, except in having black spots instead of stripes; but it is a much smaller animal, and is distinguished from the panther by the spots being arrayed in clusters instead of singly. When hunted with dogs, the leopard usually takes to a tree. The natives

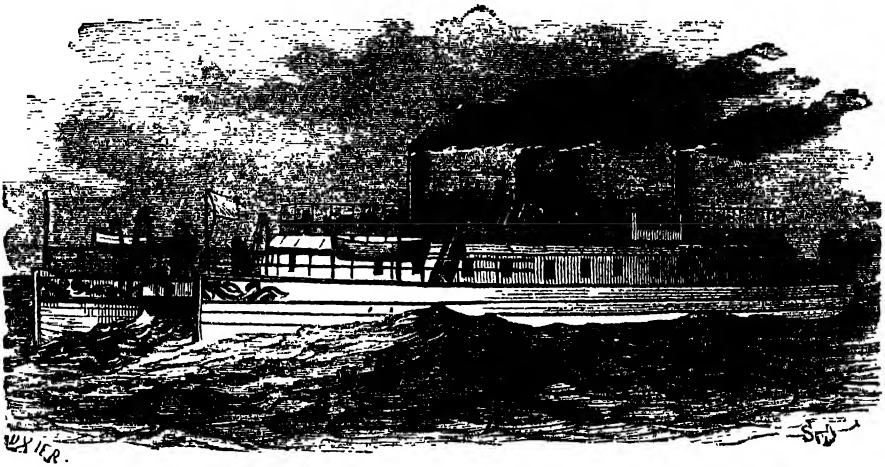
of India sometimes call it the tree tiger, from its agility in climbing trees; antelopes, monkeys, deer, and even birds fall a prey to its activity. In the ease and celerity of its bounds nothing can equal it, and the flexibility of its body and limbs enables it to creep along the ground with the cautious silence of a snake upon its unsuspecting prey. Its swiftness in pursuit is made use of in Daniel's vision to denote the extreme rapidity of Alexander's conquests. A well-known habit of the leopard is to lie in wait by the roadside near a village or watering-place, and watch for hours its opportunity of pouncing upon the cattle. This fact strikingly illustrates the passages, "A leopard shall watch over their cities," and "As a leopard by the way will I observe them."

In the Hebrew the leopard is called *namer*; and it would seem that it was formerly common in the Holy Land, as several places bear names which intimate that they were infested with them; as Nimrah, Beth-nimrah, and waters of Nimrim. "In the forests of Gilead," says Canon Tristram, "it is still so numerous as to be a pest to the herdsmen, who, with their inferior weapons, are somewhat loth to encounter it in the chase, for a wounded leopard is the most terrible and cruel of beasts. The sheikh of one village showed me no less than four skins of leopards recently killed. About the Dead Sea we frequently saw their traces. We also

tracked them on Mount Tabor, but throughout Galilee they are rare. A leopard's skin is highly prized as a saddle-cloth by the Turkish officials, and also is frequently worn over the shoulders by a certain class of dervishes."

Amongst the Kaffirs of Southern Africa the leopard's skin is part of the insignia of majesty, and a girdle of leopard's tails is proof of the courage of its possessor. The teeth of the leopard are curiously strung with beads and wire into a necklace, and hung about the throat of the dusky warrior; the claws also are put to a similar use, and the skin is carefully dried and dressed to serve as a cloak—or "kaross," as it is called.

The following anecdote, showing the cunning of the Indian leopard, is narrated by the Rev. J. G. Wood: "An ox had been killed, and the joints were hung up in a native house, which was close to a spot where a sentry was posted. In the evening the sentry gave an alarm that some large animal had entered the house. A light was procured, and a number of people searched the several rooms of which the house was composed, without discovering the cause of the alarm. They were just about to retire, when one of the party caught sight of a leopard which was clinging to the thatched roof immediately above the hooks on which the meat was suspended. No sooner did the animal discover that its presence was known than it dropped to the floor, laid about it vigorously with its claws, and leaping through the doorway, made its escape, leaving several souvenirs of its visit in various scratches, one of which was inflicted on the sentry who gave the alarm, and kept him to his bed for several weeks. The consternation caused by such an attack was very great, and many who escaped the leopard's claws suffered severely from bruises which they received in the general rush towards the door."



THE CASTALIA.

TWIN STEAMSHIPS.

THE CASTALIA AND THE CALAIS-DOUVRES.

FROM hard experience the natives of Ceylon and Southern India have discovered that the catamaran, a rough form of twin ship, is the best adapted to withstand the tossing about in the rough seas. Captain Dicey, who was for many years master attendant at the port of Calcutta, had considerable opportunity of observing the stability and trustworthiness of this form of craft, and felt great confidence in the soundness of the principle. He accordingly designed the *Castalia*, which has been running across the Channel since August, 1875. The *Castalia* is formed of two separate hulls, bridged over by one deck, the space between being occupied by the paddle-wheels. The extreme length of the vessel is 290 feet, and the breadth of the double hull is 60 feet; while each hull is provided with separate engines and a rudder at each end. Though not so fast a boat as her designer expected, she has realized a witty observation of Lord Granville, on the occasion of her christening by the

Countess, "that her ladyship's godchild was expected to be more steady and trustworthy than fast."

Dissatisfied with the low rate of speed obtained by the *Castalia*, her proprietors, the Channel Steamship Company, ordered a new ship of Messrs. Leslie, of Hebburn-on-Tyne. The *Calais-Douvres*, also a twin ship, outwardly not unlike the *Castalia*, but really of very different construction, is the result. A homely comparison will set the difference between the two twin ships in a clear light. If a lemon be cut in two longitudinally, the half of it will have the rough outline of a boat. If this half be again divided lengthwise, the two halves pulled slightly apart and then prevented from falling asunder by a bridge, it will convey a fair idea of the *Castalia*, which is a ship split open and linked together again, with a space between the halves for the paddle-wheels to work in. The space left between the two halves of the ship is therefore a gulf of equal width from stern to stern. In constructing this vessel Messrs. Leslie thought it well to abandon the plan of splitting one

ship as it were in two, and preferred that of binding two separate hulls together. The effect of this resolution is the *Calais-Douvres*, which consists of two entirely separate and distinct iron hulls, fastened together with massive iron girders, and having interior space of about twenty-seven feet amidships, but of course much more at stem and stern. The shape of the well of water enclosed is therefore very different in the *Castalia* and the *Calais-Douvres*. In the latter ship, as she is drawn through the water, it is forced from the comparatively broad space between the bows to the narrow one in which the paddle-wheels revolve, and escapes behind the wheels in a vast torrent, the expanding rush of which at the stern helps to counterbalance the resistance offered by the fore part of the ship passing through the water. Experiments have left little doubt that this, the primitive idea of a twin ship, is practically far superior to the cleft hull.

As viewed from the shore, the appearance of the *Calais-Douvres* is not unlike that of a great ironclad. Seen broadside on she gives no hint of her duplex conformation, while her great size and strange upperworks convey the notion of something between the *Monarch* and the *Thunderer*. Above the invisible bridging which unites the two hulls rises a vast hurricane deck, containing a saloon, or rather series of saloons, and above this again towers an edifice like the central fortress of an ironclad. These points of resemblance are strengthened by round houses fore and aft in the place of turrets, and the low freeboard at bow and stern, which recalls the *Devastation*.

Not only has the experience gained by the *Castalia* been turned to advantage in building the new ship, but she has been supplied with vastly superior power. Her engines, made by Messrs. Black, Hawthorn, and Co., of Gateshead, are among the

largest marine engines yet built on the Tyne. They consist of two entirely distinct and disconnected pairs of direct-acting, diagonal, low-pressure condensing engines, with two cylinders to each pair, each of 63 inches diameter and six feet stroke. Steam is supplied by four double-ended boilers, having each six furnaces. Each pair of engines drives one paddle-wheel fitted with patent feathering floats. These powerful engines are rendered necessary by the fact that it requires more than double the power to drive a twin ship than a single hull of similar dimensions. They are of 600 nominal, and capable of working up to 4,000 indicated horse-power, and drive the *Calais-Douvres* through the water at a pace sometimes reaching 15 knots. The ship herself is 300 feet long, with 62 feet beam, and is fitted up in the most luxurious manner throughout. The saloons are spacious and lofty, and, being above decks, are thoroughly ventilated.

The trial trip was a great success. The *Calais-Douvres* started from Dover against a full tide and having what little wind there was against her. So fine was the weather and inspiring the bright sea breeze that few of the company on board found leisure to admire the elegance of the great saloon, lined with marble and crimson velvet, and studded with windows enough to prevent all risk of stuffiness, the main subjects of interest being of course the rate of speed and the amount of oscillation. Of "roll" and "pitch," properly so called, there were none, the most noticeable motion being about equivalent to that experienced in a railway carriage travelling at a high rate of speed. Calais pierhead was reached in one hour and thirty-nine minutes from the time of starting—a speed which answers the question as to the qualification of the *Calais-Douvres* as a mail boat.



THE LEOPARD.
FROM A PAINTING BY HARRISON WEIR.

THE WONDERFUL VOLCANO OF HAWAII

OR,

"THE HOUSE OF EVERLASTING FIRE."



F all the phenomena in nature fitted to excite awe and wonder, perhaps none exert so commanding an influence or inspire such profound feeling as volcanoes. Science has not yet been able to throw much light upon their causes, and the fear with which they were looked upon ages ago still to a great extent takes possession of the on-looker. We can view with different feelings from our forefathers some of the other manifestations of power in nature. Their causes are to some extent known, and their forces may even be gauged and turned to advantage by man. But no one has yet discovered the hidden process by which volcanoes come into play, and we can still only conjecture what the forces are which lie beneath them.

Perhaps the most wonderful of active volcanoes is that of Mauna Loa, in the island of Hawaii, the largest of the Sandwich group. The interior of the island forms a plateau from 3,000 to 4,000 feet high, and is almost entirely covered by thick forests, partly roamed over by herds of wild cattle. Above the plateau rise three volcanic peaks, still active, the loftiest being 14,000 feet high. Mauna Loa is one of these. A most animated and vivid account of a recent visit is given by the adventurous Miss Isabella Bird in her recently published book on "The Hawaiian Archipelago." The chapter is entitled, "Alone upon Mauna Loa."

"It was a strange thing to sleep on a lava-bed at a height of nearly 14,000 feet, far away from the nearest dwelling, 'in a region rarely visited by man,' hearing all the time the roar, clash, and thunder, of the mightiest volcano in the world. It seemed all a wild dream, as that majestic sound

moved on. There were two loud reports, followed by a prolonged crash, occasioned by parts of the crater walls giving way; vibrating rumblings, as if of earthquakes; and then a louder surging of the fiery ocean, and a series of most imposing detonations. Creeping over the sleeping forms, which never stirred, even though I had to kneel upon one of the natives while I untied the flap of the tent, I crept cautiously into the *crevasse* in which the snow-water was then hard frozen, and out upon the projecting ledge. The four hours in which we had previously watched the volcano had passed like one; but the lonely hours which followed might have been two minutes or a year, for time was obliterated.

Coldly the Pole-star shivered above the frozen summit, and a blue moon, nearly full, withdrew her faded light into infinite space. The Southern Cross had set. Two peaks below the Pole-star, sharply defined against the sky, were the only signs of any other world than the world of fire and mystery around. It was light, broadly, vividly, light; the sun himself, one would have thought, might look pale beside it. But such a light! The white duck of the tent was rosy, and all the crater walls and the dull-grey ridges which lie around were a vivid rose-red.

All Hawaii was sleeping. Our Hilo friends looked out the last thing, saw the glare, and probably wondered how we were 'getting on,' high up among the stars. Mine were the only mortal eyes which saw what is perhaps the grandest spectacle on earth. Once or twice I felt so overwhelmed by the very sublimity of the loneliness that I turned to the six animals which stood shivering in the north wind without any consciousness other than that of cold, hunger, and thirst. It was a relief even to

pity them, for pity was at least a human feeling, and a momentary rest from the thrill of the new sensations inspired by the circumstances. The moon herself looked a wan, unfamiliar thing, not the same moon which floods the palm and mango groves of Hilo with light and tenderness. And those palm and mango groves, and lighted homes, and seas, and ships, and cities, and faces of friends, and all familiar things, and the day before, and the years before, were as things in dreams, coming up out of a vanished past. And would there ever be another day, and would the earth ever be young and green again, and would men buy and sell and strive for gold, and should I ever with a human voice tell living human beings of the things of this midnight? How far it was from all the world; uplifted above love, hate, and storms of passion, and war, and wreck of thrones, and dissonant clash of human thought, serene in the eternal solitudes!

Things had changed, as they change hourly in craters. The previous loud detonations were probably connected with the evolutions of some 'blowing cones,' which were now very fierce, and throwing up lava at the comparatively dead end of the crater. Lone stars of fire broke out frequently through the blackened crust. The molten river, flowing from the incandescent lake, had advanced and broadened considerably. That lake itself, whose diameter has been estimated at 800 feet, was rose-red and self-illuminated, and the increased noise was owing to the increased force of the fire-fountain, which was playing regularly at a height of 300 feet, with the cross-fountains, like wheatsheaves, at its lower part. These cross-fountains were the colour of a mixture of blood and fire, and the lower part of the perpendicular jets was the same; but as they rose and thinned, this colour passed into a vivid rose-red, and the spray and splashes were as rubies and flames mingled. For ever falling in fiery masses and fiery foam, accompanied by a thunder-music of its own, companioned only by the solemn stars, exhibiting no

other token of its glories to man than the reflection of its fires on mist and smoke, it burns for the Creator's eye alone. No foot of mortal can approach it.

Hours passed as I watched the indescribable glories of the fire-fountain, its beauty of form, and its radiant reflection on the precipices, 800 feet high, which wall it in, and listened to its surges beating and the ebb and flow of its thunder-music. Then a change occurred. The jets, which for long had been playing at a height of 300 feet, suddenly became quite low, and for a few seconds appeared as cones of fire wallowing in a sea of light; then, with a roar like the sound of gathering waters, nearly the whole surface of the lake was lifted up by the action of some powerful internal force, and rose three times, with its whole radiant mass, in one glorious upward burst, to a height, as estimated by the surrounding cliffs, of 600 feet, while the earth trembled, and the moon and stars withdrew abashed into far-off space. After this the fire-fountain played as before. The cold had become intense, 11 deg. of frost, and I crept back into the tent, those words occurring to me with a new meaning, 'Dwelling in the light which no man can approach unto.'

The base of these great volcanic mountains, thrown up from the depths of the ocean, covers an area in which the whole of Wales might be included.

In 1855 the fourth recorded eruption of Mauna Loa occurred. The lava flowed directly Hilo-wards, and for several months, spreading through the dense forests which belt the mountain, crept slowly shorewards, threatening this beautiful portion of Hawaii with the fate of the Cities of the Plain. For five months the inhabitants watched the inundation, which came a little nearer every day. Should they fly or not? Would their beautiful homes become a waste of jagged lava and black sand, like the neighbouring district of Puna, once as fair as Hilo? Such questions suggested themselves as they nightly watched the nearing glare, till the fiery waves met with obstacles which piled them up in hillocks eight miles from Hilo,

and the suspense was over. Only gigantic causes can account for the gigantic phenomena of this lava-flow. The eruption travelled forty miles in a straight line, or sixty including sinuosities. It was from one to three miles broad, and from five to 200 feet deep, according to the contours of the mountain slopes over which it flowed. It lasted for thirteen months, pouring out a torrent of lava which covered nearly 300 square miles of land, and whose volume was estimated at 38,000,000,000 of cubic feet!

In 1859 lava-fountains 400 feet in height, and with a nearly equal diameter, played on the summit of Mauna Loa. This eruption ran fifty miles to the sea in eight days, but the flow lasted much longer, and added a new promontory of Hawaii.

These magnificent overflows, however threatening, had done little damage to cultivated regions, and none to human life; and people began to think that the volcano was reformed. But in 1868 terrors occurred which are without precedent in island history. On March 27 of that year, a series of earthquakes began, and became more startling from day to day, until their succession became so rapid that "the island quivered like the lid of a boiling pot nearly all the time between the heavier shocks. The trembling was like that of a ship struck by a heavy wave." Then the terminal crater of Mauna Loa (Mokuaweoweo) sent up columns of smoke, steam, and red light; and it was shortly seen that the southern slope of its dome had been rent, and that four separate rivers of molten stone were pouring out of as many rents, and were flowing down the mountain sides in diverging lines. Suddenly the rivers were arrested, and the blue mountain dome appeared against the still blue sky without an indication of fire, steam, or smoke. Hilo was much agitated by the sudden lull. No one was deceived into security, for it was certain that the strangely pent-up fires must make themselves felt.

The earthquakes became nearly continuous; scarcely an appreciable interval

occurred between them; "the throbbing, jerking, and quivering motions grew more positive, intense, and sharp; they were vertical, rotary, lateral, and undulating," producing nausea, vertigo, and vomiting. Late in the afternoon of a lovely day (April 2nd) the climax came. "The crust of the earth rose and sank like the sea in a storm." Rocks were rent, mountains fell, buildings and their contents were shattered, trees swayed like reeds, animals were scared and ran about demented; men thought the judgment had come. The earth opened in thousands of places, the roads in Hilo cracked open, horses and their riders and people afoot were thrown violently to the ground; "it seemed as if the rocky ribs of the mountains and the granite walls and pillars of the earth were breaking up." At Kilauea the shocks were as frequent as the ticking of a watch. In Kau, south of Hilo, they counted 300 shocks on this direful day; and the earth swayed to and fro, north and south, then east and west, then round and round, up and down, in every imaginable direction, "and the trees thrashing as if torn by a strong rushing wind." An avalanche of red earth, supposed to be lava, burst from the mountain side, throwing rocks high into the air, swallowing up houses, trees, men, and animals, and travelled three miles in as many minutes, burying a hamlet, with thirty-one inhabitants and 500 head of cattle. The people of the valleys fled to the mountains, which themselves were splitting in all directions, and, collecting on an elevated spot, with the earth reeling under them, they spent the night of April 2 in prayer and singing. Looking towards the shore, they saw it sink, and at the same moment a wave, whose height was estimated at from forty to sixty feet, hurled itself upon the coast, and receded five times, destroying whole villages and even strong stone houses with a touch, and engulfing for ever forty-six people who had lingered too near the shore.

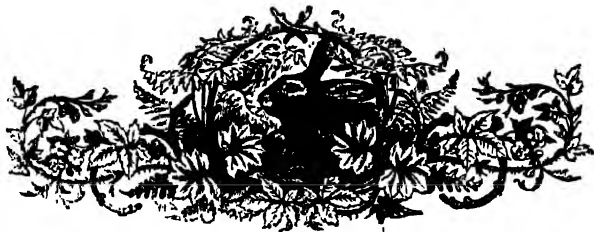
Still the earthquakes continued, and still the volcano gave no sign. The nerves of

many people gave way in these fearful days. Some tried to get away to Honolulu, others kept horses saddled on which to fly, they knew not whither. The hourly question was, "What of the volcano?" People put their ears to the quivering ground, and heard, or thought they heard, the surgings of the imprisoned lava sea rending its way among the ribs of the earth.

Five days after the destructive earthquake of April 2, the ground south of Hilo burst open with a crash and roar, which at once answered all questions concerning the volcano. The molten river, after travelling underground for twenty miles, emerged through a fissure two miles in length with a tremendous force and volume. It was in a pleasant pastoral region, supposed to be at rest for ever, at the top of a grass-covered plateau sprinkled with native and foreign houses, and rich in herds of cattle. Four huge fountains boiled up with terrific fury, throwing crimson lava, and rocks weighing many tons, to a height of from 500 to 1,000 feet. Mr. Whitney, of Honolulu, who was near the spot, says, "From these great fountains to the sea flowed a rapid stream of red lava, rolling, rushing, and tumbling, like a swollen river, bearing along in its current large rocks that made the lava foam as it dashed down the precipice and through the valley into the sea, surging and roaring throughout its length like a cataract, with a power and fury perfectly indescribable. It was nothing else than a *river of fire* from 200 to 800 feet wide and twenty deep, with a *speed*

varying from ten to twenty-five miles an hour!"

The same intelligent observer noticed as a singular peculiarity of the spouting that the lava was ejected by a *rotary motion*, and in the air both lava and stones always rotated *towards the south*. "At Kilauea I noticed that the lava was ejected in a southerly direction. From the scene of these fire-fountains, whose united length was about a mile, the river in its rush to the sea divided itself into four streams, between which it shut up men and beasts. One stream hurried to the sea in four hours, but the others took two days to travel ten miles. The aggregate width was a mile and a half. Where it entered the sea it extended the coast-line half a mile, but this worthless accession to Hawaiian acreage was dearly purchased by the loss—for ages, at least—of 4,000 acres of valuable pasture land, and a much larger quantity of magnificent forest. The whole south-east shore of Hawaii sank from four to six feet, which involved the destruction of several hamlets and the beautiful fringe of cocoa-nut trees. Though the region was very thinly peopled, 200 houses and 100 lives were sacrificed in this week of horrors; and from the reeling mountains, the uplifted ocean, and the fiery inundation, the terrified survivors fled into Hilo, each with a tale of woe and loss. The number of shocks of earthquake counted was 2,000 in two weeks, an average of 140 a day; on the other side of the island, however, the number was incalculably greater.



DAVID LIVINGSTONE:

HIS EARLY CAREER.



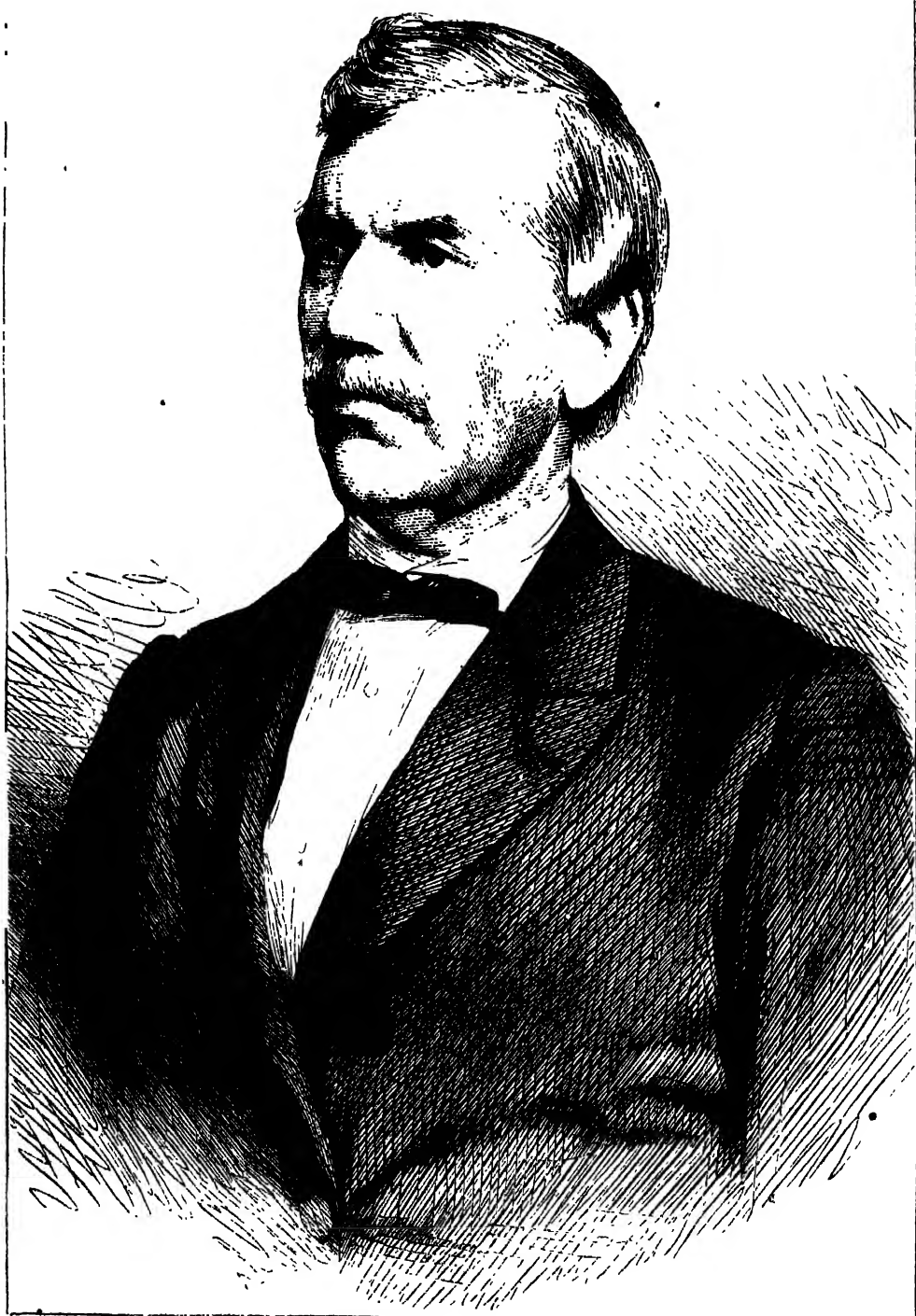
IF we are to seek for a class of men trained to a life of labour and self-denial and hardy endurance, undoubtedly we have hitherto had to search for the most favourable specimens of it in the north rather than in the south of Great Britain; in Scotland rather than in England, where free schools gave the children a training such as the English peasant could never obtain; where no poor laws had been suffered to demoralize the land, and to absolve the poor from all need of laying by something for a rainy day; and the cheap universities of which aroused ambition in the humblest breast. Rising from the soil, some of it may be expected to cling to them; but the roughest men are usually the strongest, and the son of nature has a backbone, which, alas! the man born and bred in cities and refined society often sadly lacks.

The late Dr. Livingstone belonged to this great class who have done so much to reform and improve the world. He was a Scotchman, and born of parents in a humble rank of life. The family had, however, gone down in the world. The father was a small tea-dealer in the neighbourhood of Blantyre, but the family came from the Western Islands, and the great-grandfather of David Livingstone fell at the battle of Culloden, fighting on the losing side, where, as we all know, the Duke of Cumberland gained a decisive victory over the army of the Pretender.

His son, the grandfather of the doctor, was a small farmer in Ulva, one of the Hebridian Islands, where he was held in high respect on account of his integrity and

perseverance in the midst of misfortune. He seems also to have been regarded with a species of awe on account of the legends with which his mind was stored. He delighted to record the narratives and to sing the songs he had heard in youth and childhood. People who live by the melancholy ocean are prone to superstition and legend, and though no traveller himself, old Livingstone appears to have had a head well stored with travellers' tales. He knew all the stories which Sir Walter Scott worked into his "Tales of a Grandfather." His wife also was accustomed to sing Gaelic songs, some of which *she believed had been composed by captive Highlanders languishing among the Turks*. The little David listened to these songs with intense delight. As amongst a people where books are scarce, the grandfather's traditions went a long way back.

Some of these were of a precious character. One of these poor Highlanders was renowned in the district for great wisdom and prudence; and it is related that when he was on his death-bed he called all his children around him, and said, "Now, in my lifetime I have searched most carefully through all the traditions I could find of our family, and I never could discover that there was a dishonest man among our forefathers. If, therefore, any of you or any of your children should take to dishonest ways, it will not be because it runs in our blood: it does not belong to you. I leave this precept with you." At that time honesty was but little appreciated, especially in the matter of cattle, and where the Lowlanders were concerned. At that time also the Highlanders were staunch Roman Catholics, but became converted to Protestantism according to the fashion of the age. Livingstone tells us they were made Protestants by the laird coming round with a man



having a yellow staff, which would seem to have impressed the islanders more than the new teaching, as the new gospel was known by the name of the "Religion of the Yellow Staff."

It is curious to observe how the line of demarcation has been rigorously maintained between the two races that inhabit Scotland. Livingstone was not a Lowlander, though he was born in the Lowlands. The line of demarcation between the Highlands and Lowlands has kept the inhabitants of the two divisions of Scotland so distinct that for seven centuries, as General Stewart observes, Birnam Hill, at the entrance into Athole, has formed the boundary between the Lowlands and Highlands, and between the Saxon and Gaelic languages. On the southern and eastern sides of the hill breeches are worn, and the Scotch dialect spoken with as broad an accent as in Mid Lothian. On the northern and western sides are found the Gaelic, the kilt and the plaid, with all the peculiarities of Highland character.

The Gaelic is universal as the common dialect in use among the people on the Highland side of the boundary. This applies to the whole range of the Grampians. These people for a long time lived in a state of independence of British rule. The division of the country into so many straths and valleys and islands, separated from one another by mountains or arms of the sea, naturally gave rise to various distinct societies; and individuals of superior property, courage, or ability, naturally became their chiefs; that is, at once their lawgivers, their judges, and their military chiefs, pretty much as is the case with the Kaffirs of the present day.

The whole race was thus broken up into many individual masses, possessing a community of customs and character, but placed under different jurisdictions, and every district became a petty independent state. The Highlander was then a very different man to the Lowlander, and remains so in his impatience of restraint, in his love of travel and adventure, in his honourable

desire to carve a way for himself in the world. The Livingstones had been of this race for ages.

But the time came when the family had to leave their island home and seek a living elsewhere. With feelings which only those who know the Highlander can appreciate, the head of the Livingstones left his island, and with his family removed to the banks of the Clyde above Glasgow, and near the large cotton works at Blantyre. The extensive factory of cotton-spinning and calico-weaving, established there as far back as 1785, gave extensive employment to many workpeople. It was there the grandfather died at an advanced age. As his sons had received as good an education as it was possible to give them in the Western Islands, the proprietors of the cotton mills received them as clerks. Ultimately, however, they entered the army, and bore themselves bravely in the battles at that time fought with France.

David's father, partly on account of his family, partly from his conscientious aversion to a soldier's life, remained at home, and kept a small shop—a calling which does not appear to have been the means of making his fortune. He died in February, 1856, when, as the traveller writes, "I was at the time on my way below Zumbo, expecting no greater pleasure in this country than sitting by our cottage fire and telling him my travels."

The future traveller and African explorer was born on March 19, 1813, at Blantyre. The small country town of Hamilton, where his sisters and daughters resided, is two miles beyond Blantyre, and ten miles from Glasgow. Between these places, a mile from Hamilton, is Bothwell Brig, where the Covenanters were defeated in 1679, as described by Sir Walter Scott in his "Old Mortality." The ruins of Blantyre Priory, the massive pile of Bothwell Castle, the ducal palace of Hamilton and Brandon, with the remains of the primitive forest and its far-famed white wild bulls, are close to the home of Livingstone's childhood. He was certainly familiar with all their historic

and romantic associations. No doubt many a happy hour was spent in listening to them, or in roaming about the locality thus rich in historic associations and legendary lore.

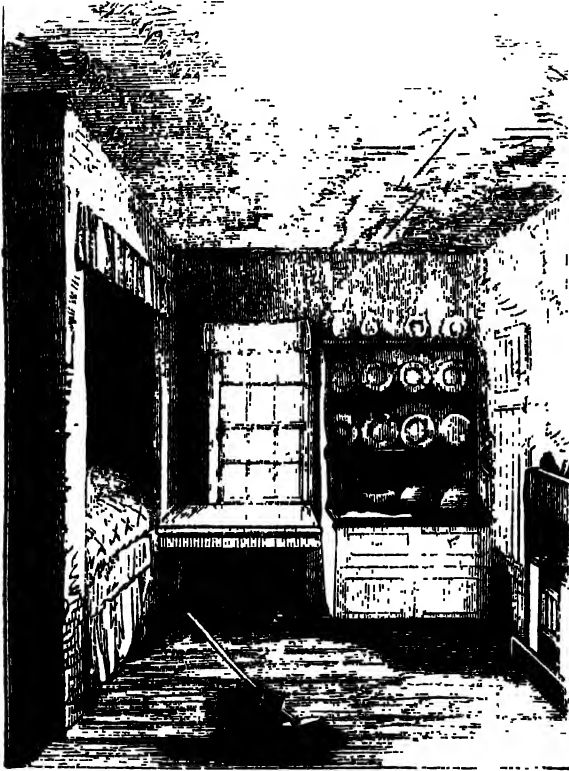
But the family circumstances were not flourishing, and at ten the lad was sent to earn his daily bread. It seems hard that it should have been so, but often "sweet are the uses of adversity"; and in the Bible we read that "it is good for a man that he bear

with unabated ardour at an evening school which met between the hours of eight and ten; the dictionary part of my labours was followed up till twelve o'clock, or later, if my mother did not interfere by jumping up and snatching the book out of my hands. I had to go back to the factory by six in the morning, and continue my work, with intervals for breakfast and dinner, till eight o'clock at night." Happily such hard work would not be permitted to a child in our more humane days; and it was a wonder that under such drudgery the boy did not become completely sensualised and broken-hearted, as was the case with so many of the poor at that time to whom knowledge "did ne'er unfold her ample page, rich with the spoils of time."

Livingstone seems to have been fortunate in his night-school. He appears to have been well grounded, and to have acquired there a sound English education, and, what was better still, to have had his natural thirst for learning stimulated and encouraged rather than crushed and rooted out. Apart from his studies, he found time for reading, and diligently mastered everything that came in his way. The boy was also religiously trained by his father, who was externally stern and taciturn, and an ever strict disciplinarian where the members of his own family were concerned.

He brought up his children in

connection with the Church of Scotland, from which he seceded a few years before his death, and joined an Independent congregation at Hamilton. "He deserved my lasting gratitude," wrote the Doctor, "and homage for presenting me from infancy with a consistently pious example, such as that the ideal of which is so beautifully and truthfully portrayed in Burns' 'Cotter's Saturday Night.'" The last time the father applied the cane to the Doctor's



THE ROOM IN WHICH LIVINGSTONE WAS BORN.

the yoke in his youth." Certainly it was so in the case of David Livingstone. While as a boy he was working as a "piecer" in the cotton factory, he tells us his passion for books was overpowering. To possess them was the one great object of his life. He thought of nothing but how to use them aright. With a portion of his first week's wages he purchased a Latin Grammar; and, as he himself says, "I pursued the study of that language for many years afterwards

back was when he refused to read Wilberforce's "Practical View." The doctor's mother was cast in a gentler mould.

It was the dream of Livingstone, while even a "piecer" at the mills, to become a student at the Glasgow University.

It was fortunate for Livingstone that he was a Scotchman, and could avail himself of such an advantage. In his nineteenth year he became a spinner, and his wages were raised. His labours now became very severe, and to a youth naturally delicate, excessively trying; but he was enabled to realize his ambitious hopes, and to become a student at the University of Glasgow. During the winter, therefore, he studied medicine and Greek; and in the summer attended divinity lectures, to attend which he had to walk to and from his father's house daily, a distance of nine miles. He never received a particle of aid from any one, nor did he expect any. In his own mind he was only doing what others did. In his case, however, he had an additional stimulus.

There had been a religious awakening in his neighbourhood when he was sixteen, and Livingstone had come under its influence; and to be a missionary amongst the Chinese was his purpose when he attended the classes of the university. Unaided by any patronage, he finished his course, and was admitted as a licentiate. His success was nearly marred, however, by the persistency with which he, in the presence of the examiners, adhered to an opinion of his own about the powers of life stethoscope.

And in the same uncompromising spirit of independence he had intended to make his way to China unhampered by connection with any organised society. But some friends having commended to his consideration the unsectarian character of the

London Missionary Society, which, as they assured him, sent "neither episcopacy, presbyterianism, nor independency," but the gospel of Christ, to the heathen, he was induced to offer himself for the acceptance of that Society. "Yet," he says, "it was not without a pang I offered myself; for it was not quite agreeable to one accustomed to work in his own way to become, in a measure, dependent on others, and I would not have been much



HOUSE WHERE LIVINGSTONE DWELT IN HIS YOUTH.

put about though my offer had been rejected."

When his offer of himself was accepted, he was sent for a while to a little town in Essex, Ongar, where several students intended for missionary work, or for ministerial usefulness at home, were placed under the care of the Rev. Mr. Cecil, an Independent minister there, and nephew of the celebrated Cecil, the Evangelical clergyman, whose memory in many circles is yet dear.

Of Livingstone's student life at Ongar we have few memorials. One who was with him at the time, the Rev. Thomas Fison, B.A., of Hendon, remembers, however, distinctly on one occasion in which it fell to the turn of Mr. Livingstone to conduct family worship, he was so completely overcome by the passage in the Old Testament in which there was a reference to the slave, that he completely broke down, and was unable to say another word. He was also noted for his powers of physical endurance, and would at times walk to London and back in a day, a distance of at least forty miles. At Ongar his habit was to take a compass, and to work by that, through hedges and over ditches and across fields, as if he then were, what he afterwards became, a pioneer in geographical discovery.

Ongar, as we all know, is ground dear to many as the home of the Taylors, and as the burial-place of Jane, whose "Hymns for Infant Minds" still hold their place in the homes and hearts of the people. Mr. Davenport Adams writes as follows of David Livingstone at Ongar, and speaks of him as a pale, thin, modest, retiring young man, with a broad Scotch accent; if you broke through the crust of his natural reserve, you found him open, frank, and most kindhearted, ever ready for any good and useful work, not even excepting grinding the corn necessary to make the brown bread in the establishment, chopping wood, and such-like laborious though healthy occupations. He was fond of long walks, and he and a friend used to traverse the Essex flats together, sometimes extending their peregrinations into the more romantic neighbouring counties. Twelve or sixteen miles were often thus traversed; and the friends, as they passed along, enjoying the beauties of nature, indulged, we may be sure, in profitable conversation, anticipating, no doubt, the triumphs of the Redeemer's kingdom, and strengthening and encouraging each other to pursue the path of Christian duty with faith and earnestness of purpose. Even during these long walks the friends pursued their studies, assisting

each other to acquire a more perfect knowledge of the Greek and Latin tongues.

Livingstone exhibited considerable aptitude in the acquisition of languages; but his chief characteristic then, as it proved to be all through his career, was indomitable resolution and perseverance. An incident which occurred at this period may serve to illustrate the quality of his mind, and show what might be expected of him when he had to contend with dangers and difficulties.

On one of the coldest and most foggy mornings in 1838, he got up at three o'clock to walk to London, in the western suburb of which he had some business to transact for his father. As he was returning, his knowledge, energy, and humanity, were called into play. A lady was thrown out of a gig, and Livingstone, without regard to the etiquette of the thing, at once offered his services, and instituted an examination, which resulted in an assurance that there were no bones broken. Having performed this good office for a fellow-creature in distress, our traveller trudged on his homeward way. Long ere he reached Stanford Rivers, about two miles from Ongar, it had become quite dark. He was sadly wearied and faint with hunger, having scarcely eaten any food all day, but he determined to push on, and did so. Presently, however, he found himself on strange ground, having evidently taken a wrong turning somewhere. Here was a new perplexity; his knees trembled under him, and he seemed almost constrained to lie down under the hedge and make his bed there. But no, that would not do for Livingstone, whose motto was, "Never give up." So he braced up his energies by an effort, climbed a guide post, and by the light of the stars, which were now shining clearly above him, made out his whereabouts, and again pushed out for home, where he arrived pale as a ghost, and sank into a seat so exhausted that for a while he could not utter a word. After taking a little food, moistened with milk and water, he went to bed, and slept soundly till the middle of the next day, when he

awoke perfectly refreshed, and ready for another journey. He had walked upwards of fifty miles.

Livingstone was a strong advocate for teetotalism ; when at Ongar, he and some of the other students drew up a pledge which they severally signed. He did not in his student days shine as a speaker ; his delivery was slow and hesitating. It is recollected that he once bestowed great pains on the composition of a sermon which he intended to repeat from memory ; but when he mounted the pulpit, and attempted to do so, the whole had escaped him.

After he left Ongar, he came to London, and attended, we believe, some of the medical classes in connection with University College. As a medical man, and master of the healing art, a missionary enjoys many advantages. Dr. Livingstone was perfectly well aware of this. He writes, "It was with unfeigned delight I became a member of a profession which is pre-eminently devoted to practical benevolence, and which, with unwearied energy, pursues from age to age its endeavours to lessen human woe." The outbreak of the opium war with China compelled him reluctantly to abandon his intention of proceeding to that country ; but he was happily led to bestow his attention to South Africa, where at that time the successful labours of Mr. (now Dr.) Moffat were attracting the attention of the Christian public in this country ; and, in order to co-operate with him in the great work, he landed at Cape Town in 1840.

Up to this period of his life we have

scarcely any details. He is almost silent as to the dawn of that religious spirit within him which helped to make him what he was. This was, as a writer in the *British Quarterly Review* points out, the healthy practical devotion which forms the best comment on St. James's words, "Ye see then how that by works a man is saved, and not by faith only." Yet it is pleasant to note in the fulness of his fame the fondness with which he recalled the memory of those plain old Christian brethren who had been as ministers of Christ to him in his native village. "Now, lad," said one of them on his deathbed to the future apostle of Africa, "make religion the everyday business of your life—not a thing of fits and starts ; for if you do not, temptation and other things will get the better of you." And there is one sentence of his own which, coming from one so reticent, carries a world of meaning : "In the glow of love which Christianity inspires I soon resolved to devote my life to the alleviation of human misery."

Thus the man was ready, and only awaited some indication of his future life. Strong-willed, honest, and sturdily independent as he was, influences had reached him that unsealed the larger love of life already latent within. A career of money-getting, or the ambition of fame, or even the pursuit of knowledge, had no charms for the ardent youth. In his heart of hearts he had the great principle implanted of love to God and love to man. In his case, at any rate, the enthusiasm of humanity was the direct result of religious principle.



AN ADVENTUROUS DIVER.



LEUTENANT HARDY, R.N., was sent to Mexico by a London company in the year 1825 to inquire into the state of the pearl and coral fisheries and their prospect of success. The fishery he found in a very poor state, and further ascertained that the use of diving-bells for the purpose, however desirable they might be, could not be made available. He found that in many places the divers were afraid to go down, for fear of the *tintereros*, or ground-sharks, and the *mantas*, or *marrayos*. This latter fish, he was informed, is an immense broad fish, formed like a skate. They hug the divers with two large fins, and carry the poor fellows off. One was struck by a Captain Hall with a harpoon, and when taken, was found to measure twenty feet across the back! Notwithstanding these dangers, and anxious himself to ascertain the state of the oyster banks, Mr. Hardy became a diver, and gives a graphic account of his own adventures in this perilous trade.

"If it be difficult to learn to swim," says Mr. Hardy, "it is infinitely more so to dive. In my first attempts, I could only descend about six feet, and was immediately obliged to rise again to the surface; but by degrees I got down to two or three fathoms, at which depth the pressure of the water upon the ears is so great that I can only compare it to a sharp-pointed iron instrument being violently forced into that organ. My stay under water therefore at this depth was extremely short; but, as I had been assured that as soon as the ears should burst, as it is technically called by the divers, there would be no difficulty in descending to any depth, and wishing to become an accomplished diver, I determined to brave the excessive pain, till the bursting should, as it were, liberate me from a kind of cord, which limited my range downwards in the

same way that the ropes of a balloon confine the progress of that machine upwards.

Accordingly, taking a leap from the bows of the boat, full of hope and resolution, with my fingers knit together over my head, the elbows straight, and keeping myself steadily in the inverse order of nature—namely, with my feet perpendicularly upwards—the impetus carried me down about four fathoms, when it became necessary to assist the descent by means of the hands and legs. But, alas! who can count upon the firmness of his resolution? The change of temperature from hot to cold is most sensibly felt. Every fathom fills the imagination with some new idea of the dangerous folly of penetrating farther into the silent dominions of reckless monsters, where the skulls of the dead make perpetual grimaces, and the yawning jaws of sharks and *tintereros*, or the death-embrace of the *manta*, lie in wait for us. These impressions were augmented by the impossibility of the vision penetrating the twilight by which I was surrounded, together with the excruciating pain I felt in my eyes and ears: in short, my mind being assailed by a thousand incomprehensible images, I ceased striking with my hands and legs; I felt myself receding from the bottom; the delightful thought of once more beholding the blue heavens above me got the better of every other reflection; I voluntarily changed the position of my body, and in the next instant found myself once more on the surface. How did my bosom inflate with the rapid inspirations of my natural atmosphere, and a sensation of indescribable pleasure spread over every part of the body, as though the spirit was rejoicing at its liberation from its watery peril! In fact, it was a new sensation, which I cannot describe. I did not suffer it, however, to be of long duration.

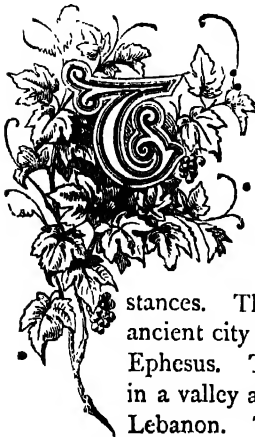
Once more I essayed, with a more fixed

determination. Again I felt myself gliding through the slippery water, which, from its density, gave one the idea of swimming through a thick jelly; again I experienced the same change of temperature in the water as I descended; and again the agonising sensation in my ears and eyes made me waver. But now reason and resolution urged me on, although every instant the pain increased as I descended; and at the depth of six or seven fathoms I felt a sensation in my ears like that produced by the explosion of a gun; at the same moment I lost all sense of pain, and afterwards reached the bottom with a facility which I had thought unattainable. I no sooner found myself at the surface again than I became sensible of what had happened to my ears, eyes, and mouth: I was literally bleeding from each of these, though wholly unconscious of it. But now was the greatest danger in diving, as the sharks, mantas, and *tintereros*, have an astonishingly quick scent for blood."

In a short time our adventurous hero became a most expert diver; and after numerous submarine excursions, he ascertained that, on the coast of California, the

pearl-oysters are not lying, as he had always previously supposed them to be, in regular beds or heaps, but that they chiefly occurred in sheltered bays, the bottoms of which were covered with large rocks; and that they were most abundant in fissures or clefts of these rocks, adhering firmly by a strong byssus,—so strongly, indeed, that it requires no little force to tear them away. In such a coast as that, therefore, diving-bells, he soon saw, could be of no use, for though they would afford, a complete protection to the diver from the voracious monsters of the deep, yet the particular situations in which the oysters occurred most abundantly would necessarily prevent the people employed in descending in the diving-bells from reaching them.

In diving, Mr. Hardy tells us it is usual for the person so employed to carry a short stick about nine inches long, and pointed at both ends. Armed with this, an experienced diver will often fight the shark in its own domain. He grasps the stick in the middle; and when attacked by the shark, he thrusts it into the monster's expanded jaws, in such a position that, in attempting to seize his victim, the jaws close upon the sharp points.



THE RUINS OF BAALBEC.

THE day was clear and beautiful, and we were able to inspect the famous temple ruins under the most favourable circumstances. The situation of the ancient city is not unlike that of Ephesus. The ruins lie partly in a valley at the base of Anti-Lebanon. The walls of the city are about two and a half miles in circumference, only small portions of which are now standing. The whole space within these walls is strewn with ruins, consisting

of broken columns, architraves, cornices, and portions of friezes, exquisitely sculptured, giving one some faint idea of the original beauty and magnitude of the buildings.

The architecture is evidently the work of different ages. The huge masses of stone that form the substructure of platforms and walls are of the Cyclopean period known as that of the Early Phœnician, and perhaps anterior to that of the Temple of Jerusalem; but the most beautiful of the ruins are of the Greek and Roman period. The limestone of which the platform and walls are formed, was quarried in the neighbourhood, and some idea may be formed of the

magnitude of the stones employed by referring to one, which is now lying near the place from which it was quarried. This stone measures about 70 feet long by 14 feet broad and 17 feet deep. The marvel is how stones of this size were moved and elevated to their present position in the buildings.

The ruins consist of three distinct buildings, viz., the two greater temples, and the lesser one called the Circular Temple. The Great Temple covers an area of nearly 1,000 feet from east to west, and about 500 feet from south to north. A few of the columns on the south side are still standing, with the foundations of the peristyle and the base of the columns. These stand on an elevated platform about 40 feet from the plain. This temple seems to have consisted of a centre court of 400 feet square, surrounded with portico and peristyle, the columns of which were 65 feet high, and over this was an entablature of 14 feet formed of immense blocks of stone beautifully and elaborately sculptured.

The next, and by far the most magnificent of all the ruins, has been called the Temple of the Sun. The walls, and some portions of the peristyle and portico, are still standing; these are raised on a platform of 30 feet from the ground. Six of the columns, with their architrave, are still in their original position. The building is in the form of the Parthenon of Athens, but larger, and of a different order, this being pure Corinthian. The height of the columns now standing is about 65 feet, including base and capital, and resting on these are the remains of a beautiful architrave. But the marvel of this building is the remains of the great portal. It was 21 feet wide and 42 feet high, surmounted by an architrave and frieze of nearly 20 feet. This magnificent portal was shattered by an earthquake in 1759. The centre stone of

the lintel has given away, and now both sides hang in the air, but even in its ruins it forms one of the most wonderful works of skill and labour in the world. The late David Roberts says of it: "This is perhaps the most elaborate work, as well as the most exquisite in its detail, of anything of its kind in the world."

The last and smallest of these ruins is called the Circular Temple, lying to the south-east of the Great Temple. This was at one time used by the Greek Christians as a church, but is now neglected. It is perhaps the purest and most classical of all these buildings, and of the best period of Greek art, and is supposed to have been dedicated to Venus. The walls and beautiful entablature are now rent and dilapidated, and as nothing is done to sustain them, the whole may in a short time be nothing but an indistinguishable heap of ruins.

It is rather curious that we should know less of this once magnificent city than of any other in Palestine. It is not once mentioned in sacred history that I am aware of, and it is but slightly referred to by Greek and Roman writers. There is no doubt, however, that it was an early and important city of the Phœnicians, and retained its importance down through the Greek and Roman period, till the blight of the Moslem fell upon it.

We had scarcely four hours to ride over these ruins, and of course had no time to look into details, but the *tout ensemble* has left on my mind a dream of pleasure and satisfaction which I find it impossible to describe, but which I can never forget; and if I had had no other object in my journey, I should consider the privilege of visiting these splendid ruins before barbarism and earthquakes have strewed them over the ground an ample reward for all my troubles and fatigues.

THE
JETTING POOLS OF ICELAND.



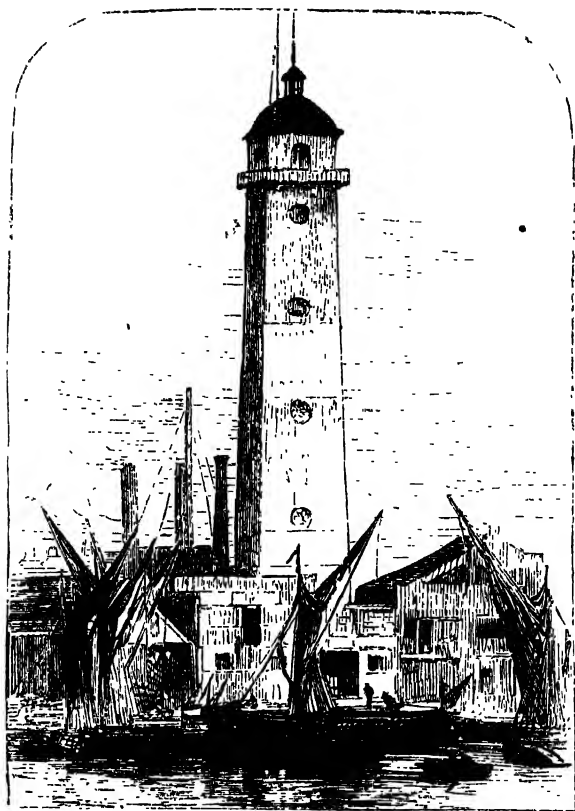
N Iceland, a desolate region of ice and snow, volcanic action is seen in full force. Here Hecla rages as of old ; and here hot fountains and springs bear witness to the incandescence of the earth's interior. In the crater of the volcano, called Krabla, there is a boiling caldron, or pool, which is one of the most remarkable curiosities of the island. Many travellers have visited and described it.

At the bottom of a deep gully (says one) lay a circular pool of black liquid matter, at least three hundred feet in circumference, from the middle of which a vast column of the same black liquid was erupted with a loud thundering noise ; but being enveloped in smoke till within about three feet of the surface of the pool, I could not form any idea of the height to which it rose.

From every circumstance connected with the vast hollow in which the pool is situated, I could not but regard it as the remains of the crater which, after having vomited immense quantities of volcanic matter, has loosened the adjacent parts of the mountain to such a degree that they have fallen in and left nothing but the boiling caldron to mark its site, and perpetuate in faint adumbrations the awful terrors of the scene. The surface of the pool may be about seven hundred feet below what appeared to be the highest peak of Krabla, and about two hundred feet below the opposite height on which I stood.

Having continued some minutes to disgorge its muddy contents, the violent fury of the spring evidently began to abate ; and, as the ground along the west side of the hollow seemed sufficiently solid, I got the guide to accompany me to the immediate precincts of the pool. On the northern

margin rose a bank consisting of red bolus and sulphur, from which, as the wind blew from the same quarter, we had a fine view of the whole. Nearly about the centre of the pool is the aperture whence the vast body of water, sulphur, and bluish-black bolus, is thrown up, and which is equal in diameter to the column of water ejected from the Great Geyser at its strongest eruptions. The height of the jets varied greatly, rising on the first propulsions of the liquid to about twelve feet, and continuing to ascend, as it were by leaps, till they gained the highest point of elevation, which was upwards of thirty feet, when they again abated much more rapidly than they rose ; and after the spouting had ceased, the situation of the aperture was rendered visible only by a gentle ebullition which distinguished it from the general surface of the pool. During my stay, which was upwards of an hour, the eruptions took place every five minutes, and lasted about two minutes and a half. I was apprised of the approach of an eruption by a small jetter that broke forth from the same pool, a little to the east of the great one, and was evidently connected with it, as there was a continual bubbling in a direct line between them. None of its jets exceeded twelve feet, and generally they were about five. Another bubbling channel ran a little way to the north-west of the principal opening, but did not terminate in a jetter like the former. While the eruption continued, a number of fine silver waves were thrown round to the sides of the pool, which was lined with a dark blue bolus, left there on the subsidence of the waves. At the foot of the bank on which we stood were numerous small holes, whence a quantity of steam was unremittingly escaping with a loud hissing noise ; and on the west side of the pool was a gentle declivity, where the water ran out and was conveyed through a long winding gully to the foot of the mountain.



THE OLD SHOT TOWER, LAMBETH.

HOW LEAD SHOT IS MADE.

SMALL shot is of various sizes. Ranging from swan-shot, nearly as large as peas, to dust shot. It is made by dropping molten lead through a colander in rapid motion from a considerable height into water. The lead falls in small globular drops. The holes in the colander vary in size according to the denomination of the shot.

The Old Shot Tower at Lambeth is one of the oldest in England, and was built about a hundred years ago. It was partly constructed of wood, and in February, 1826, was nearly totally destroyed by fire, but was restored and rendered fire-proof in the following August.

The highest shot tower in the world is at Villach, in Carinthia, where there is a fall of 349 feet.

The first thing in the manufacture of shot is to impregnate the lead with arsenic, to make it more ductile and more ready when melted to take the globular form. This is done in a kind of kettle. The arsenic is melted beneath the cover; the kettle is then filled with lead, and when this is melted, the cover is withdrawn, the lead instantly becoming permeated with the arsenic. The alloy which is thus made is called "temper," and is in the proportion of forty-five pounds of arsenic to the ton of lead. This is added in the proportion of one per cent. to the pure lead. The amount

of arsenic in a single shot is therefore extremely minute.

The leaden shot of the sportsman was, up to a comparatively late date, cast in moulds, as leaden bullets are now; though of course not singly, as bullets sometimes are. The very first process of metal casting we ever witnessed was performed by an old Suffolk farmer, whom we saw, in the fierce winter of 1814, casting his own shot for the replenishing of his leather sporting belt. The impressions made by the witnessing of a mechanical process on the mind of a child of eight or nine years of age are perhaps not much to be relied on after the lapse of fifty years; but we distinctly recollect that the mould the old farmer used resembled a pair of pincers whose jaws were some nine inches in width. The moulds for the shot were sunk in the flat sides of these jaws, and may have been some thirty in number; so that every time the pincers were dipped in the metal-pot thirty shots were cast. How the shots were treated afterwards, or what treatment they required before they were ready for use, we cannot now recall.

Long before the time of which we speak, however, lead shot was made by a process very different from casting, and which, indeed, closely resembles the natural process by which rain is converted into hail. The inventor of this new method was one Watts, a plumber of Bristol, and he is said to have received his first idea of it while asleep in his bed. He dreamed that he was walking abroad in a shower of rain, but that, instead of water which came down from the clouds, it was molten lead, and he saw, to his surprise, that the drops as they fell were perfectly globular. In order to test the idea of his dream he poured some melted lead from the top of the tower of St. Mary's Church, Redcliff, into some water below. The experiment was crowned with success, and the result was that the dreaming plumber sold his invention for a large sum of money.

The lead shot of the sportsman is now all made by this process. As, in order to

ensure success, the fluid metal must fall from a considerable height, shot-wells have been dug, and shot-towers erected, both furnishing sufficient altitude for the fall. On visiting a shot-tower, we find that the height of the shaft is not less than two hundred feet. To reach the top, where the melting and launching of the metal takes place, we have to climb a circular iron staircase lighted only by a glimmer from above, and affording but a narrow footing not at all satisfactory to a nervous subject.

Landing near the top, we find ourselves in a circular dusty apartment, where a single figure is bending over the melting-pot, with a number of pigs of lead lying around him on the floor. In the centre of the floor is an open trap-door, and far above our head, in a line directly over it, is another; for we have arrived only at the first melting-room, which is used for the formation of the smaller sizes of shot, a greater fall than is obtained from this elevation being necessary for the shot of largest size. The rough walls of this room are crusted all over with a foul greenish deposit, which is a mixture of sulphur and arsenic, the sulphur emanating from the lead in fusing, and the arsenic being added in certain proportions for the sake of at once hardening the metal and ensuring its more complete sphericity. These poisonous fumes have a sad effect upon the health of those destined to inhale them continually, and thus shot-casting adds another instance to the list of fatal results attending our industrial processes.

Placed right over the trap-door, and supported in an iron frame, is a small vessel aptly termed a "colander," being about twelve inches in diameter, and furnished with a handle. The bottom of this vessel is pierced thickly with holes, the size of the holes determining the size of the shots to be formed; and they differ, of course, in different colanders, varying from one-fiftieth of an inch in diameter for large shot, down to one-three-hundred-and-sixtieth for the very smallest. The dimensions of the holes are, of course, very much smaller than those of the shot produced, the fluid lead passing

through the holes in fine threads, and forming into globules in the course of their descent.

We note that the operator does not pour the fluid metal into an empty colander : he

Therefore he first covers the bottom of the colander with a layer, tolerably thick, of the dross or oxide of lead taken from the surface of the melting-pot, and does not pour in his charge until he has proved by experi-

ment that he has interposed a sufficient quantity of this stuff, and no more, to regulate the flow. Then he ladles out the lead pretty rapidly, and, as it flows through in a continuous stream, we hear it plunging into the deep water-vat placed for its reception below.

There is not much more to see in this grim sky-parlour, and, after looking round us for a few minutes, we begin to retrace our steps down the spiral staircase. We have not descended much more than half the distance when the voice of our friend above is heard in a shout of warning to those below, and the next moment down comes another charge of the liquid metal. The fall is accompanied by a sharp hissing sound, and it has the appearance of a dazzling cataract of glistening silver, startlingly beautiful to look at, yet forcing one to recoil instinctively from its terrible swoop. As the stream plunges into the water below the noise might be compared to a thousand or two volunteers maintaining a continuous fire from their rifles.

At the bottom we find the men removing the shot from the tub, which, shining like silver, are carried off to the drying-room, where they are dried upon iron plates heated by steam. The method of separating the imperfect shot from the perfect ones is ingeniously simple. The whole



AT THE TOP OF THE TOWER.

tells us that, if he were to do so, it would flow too fast, and the result would not be shot in any quantity, but rather long, elliptic, and irregularly-shaped pieces of metal.

are strewed about along the upper part of an inclined plane formed by a slab of smooth iron tilted at a certain angle : the well-formed round shot roll down rapidly in

straight lines, and bound over the edge of the slab into a bin placed beneath to receive them ; while the shreds and pieces of metal not globular move in various directions with a zig-zag motion, and, not acquiring sufficient impetus to overleap the ledge, are deposited in a receptacle at the end of the incline.

The shots, which shone like silver on being taken from the water, assume a white frosted appearance after being dried. The sorting of them is the next process, and it is accomplished by means of a machine made somewhat on the principle of the flour-dressing machine, and which, while the shot revolves in perforated cylinders, deposits the several sizes in their respective bins.

The final process in their manufacture is that of blackening and polishing. This is done by putting several hundredweights of the shot at a time into a cast-iron barrel, together with a certain quantity of black-lead powder ; the barrel is then stopped tight, and made to revolve rapidly by means of the steam-engine. When taken from the barrel, the shots are smoother, more globular, and have changed their frosted white hue for the shining jet-black appearance with which everybody is familiar. Nothing now remains to be done save to pack them, and sew them tightly up in stout canvas bags weighing twenty-eight pounds each—a business which is mostly accomplished by women, whom we find at the work in a large room appropriated to them.

There are twelve sizes of shot known to sportsmen, and which are designated by their numbers. The largest, called also swan-shot, is nearly as large as a common field pea ; the smallest, or No. 12, called

sparrow-shot, is less than the smallest pin's head. A still smaller size than this is made at some shot factories, which is not bigger than grains of sporting gunpowder, and is prized by naturalists and collectors, who



AT THE BOTTOM OF THE TOWER.

use it on their travels for shooting butterflies and small tropical birds, which would probably be torn to pieces if struck by shot of average size.

Buck-shot, which range in size from

twenty-two to thirty-eight hundredths of an inch, are moulded. The moulds consist of a series of pivoted bars, the outer pair of which have handles. The upper edges of these bars are hollowed to form the moulds, so that when they are closed together, the opposite halves of each cavity unite, and it is only necessary to pour the lead into the apertures. The shot are thus at once moulded to the proper size, so that runbling and polishing only are subsequently required.

Lead is very widely distributed throughout the British islands. The oldest mines, or, at least, those which we know to have been worked the longest, are in the neighbourhood of Wirksworth, in Derbyshire, the working of which can be traced back as far as the year A.D. 714. At the present time the most productive mines are situated in the great mineral chains of the North of England—in Northumberland, Cumberland, Durham, and York. Other English mines, almost equally productive, are worked in Devonshire and Cornwall. In Scotland lead is found in great abundance in the "lead-hills" on the borders of Lanarkshire; and Ireland has mines in Wexford, Donegal, Armagh, and in the mountains of Wicklow.

There are several kinds of lead found in these islands, and, indeed, the list comprises as many as ten different varieties. The

lead ore of commerce is, however, the variety which is most profitable to the manufacturer, to which mineralogists have given the name of "galena," and which contains from seventy to eighty per cent. of pure metal. The value of this mineral, however, is not determined so much by the percentage of pure lead which it will yield to the smelter as by the quantity of silver it contains. All British lead contains silver in greater or less quantities, and, as the precious metal is easily separated from the lead, it is that which fixes the value of the ore. Thus ores which are equally productive of lead will occasionally differ a full half in value, and even more; the prices having been known to vary as much as from £7 to £20 the ton.

The quantity of silver derived from the lead produced in the island of Great Britain amounts to near one million ounces per annum, and, valued at five shillings the ounce, is worth nearly £250,000. The lead of the southern mines yields a much greater quantity per ton than that of the northern, and the silver produce of Cornwall exceeds one-fourth of the whole amount. The yield of the lead-mines of these islands is about one hundred thousand tons of ore per annum, giving over seventy thousand tons of metal, the entire value of which may be taken at £1,000,000.



WEIGHING AND PACKING.

OSTRICH HUNTING



THE capture of the ostrich is the greatest feat of hunting to which the Saharan sportsman aspires, and in richness of booty it ranks next to the plunder of a caravan. So great is the cost and toil of the chase, that it is generally estimated the capture of an ostrich cannot be effected without the loss of a horse or two. So wary is the bird, and so vast are the plains over which it roams, that no artifices or ambuscades can be of any avail. The only resource is to pursue them with dogged perseverance, and for this work the poor horses have to undergo a long and painful training. The North African ostrich is less gregarious than that of the Cape, generally living in companies of from four to six individuals, which do not appear to be in the habit of wandering more than twenty or thirty miles from their head quarters.

"Once, and once only," says Mr. Tristram, "I had the good fortune to take an ostrich's nest, though fresh eggs were not unfrequently brought in by the Arabs. It was some months subsequent to this occasion, when we observed with our telescopes two birds standing for some time in the same spot, and were induced to ride towards them. They rapidly scudded off, but on intersecting their track, we turned back and retraced it, instead of continuing a vain pursuit. An ostrich's track is by no means easy either to follow or to retrace, for his stride measures, at full speed, from twenty-two to twenty-eight feet, and the oblong impression of two toes at such wide intervals affords no very evident 'spoor' to any eyes less expert than those of a Bedouin huntsman. We retraced the impressions to the spot where we had seen the birds stand-

ing together, and where the sand was well trodden down. Two Arabs, at once dismounting, began to dig with their hands, and presently brought up four fine fresh eggs from the depth of about a foot under the warm sand. They are excellent eating, and cannot be distinguished from hens' eggs in flavour. Ostrich egg omelet we always found a most welcome addition to our desert bill of fare, and a convenient and portable provision, for, from the thickness of the shell, the eggs keep perfectly sweet and fresh for a fortnight or three weeks."

On another occasion the travellers saw six ostriches at a great distance. The Arabs galloped in pursuit, though, unsuccessful as usual, they returned in an hour or two. There is something apparently irresistible to the nomad in the charm of an ostrich hunt, and often as the exhausted horses had vainly suffered in the toilsome pursuit, there was no restraining their attendants, when the alarm was given, from scampering wildly over the plains. The most skilful sportsman generally adopt the plan of sending two or three hunters to follow the herd at a gentle gallop, endeavouring only to keep the birds in sight without alarming them, when they would take to their full speed and be speedily lost to view. In the meantime the rest of the party proceed in a direction at right angles to the course the ostriches have taken, knowing by experience their habit of coursing in a circle. Their object is to intersect the path of their game, and for this purpose they post themselves on the best look-out they can find, and wait for hours in patience. If fortunate enough to detect them, they follow the now exhausted flock, and often succeed in running down one or more. When overtaken, the bird offers no resistance beyond kicking out sideways.

TRAVELS IN THE AIR.



NO ascent in aerostatic annals was more famous for many years than that of Gay-Lussac, who, in September, 1804, started from Paris and reached the height of 23,000 feet. To lighten the balloon he threw overboard every article he could possibly dispense with; a common deal chair went with the rest, and fell into a hedge close to a girl who was tending some sheep. As the sky at the time was clear and the balloon invisible, some of the country-folk held that it must have come straight from Paradise, and cried, "A miracle!" others refused to think that "the workmen up above there could be such muffs," for the chair was roughly made; but the miracle-mongers would, no doubt, have carried the question had not a timely account of Gay-Lussac's voyage appeared in the papers.

Several years later Andreoli and Brioschi ascended, it is said, but it has never been fully believed, to an elevation of 30,000 feet, when the balloon burst with a loud report, and came to the ground with great speed, but safely, near Petrarch's tomb. The torn balloon must have acted as a parachute. Mr. Glaisher has himself fallen, in his balloon, two miles in four minutes, and has landed without being greatly hurt. He and Mr. Coxwell became the champion aeronauts after their memorable ascent from Wolverhampton on the 5th of September, 1862. They rose to the enormous height of 37,000 feet, a mile higher than the highest peak of the Himalayas; at 29,000 feet Mr. Glaisher became insensible. The valve line was entangled, and Mr. Coxwell had to climb from the car into the ring to readjust it; the cold was so intense that he lost the use of his hands and had to pull it with his teeth. But the prince of aeronauts was Mr.

Green, who made some 1,400 excursions into the air. He was not much of a scientific observer, having (as he told M. de Fonvielle, who visited the old man in his latter days) "to make his bread by it," *i.e.*, by mounting into the clouds for the delectation of those who resort to tea-gardens.

Let us suppose that the aeronaut has resolved to make a prodigious ascent for strictly scientific purposes. He has succeeded in borrowing (for there seems to be a great deal of borrowing among aeronauts) a balloon, and has had it conveyed overnight to the gasworks, where it is to be filled. He has secured the services of an experienced balloon captain to take the exclusive management of the balloon, and has borrowed from various societies a number of beautiful and delicate instruments wherewith to make his observations. At daybreak the two aeronauts—or as we will call them for the sake of distinction, the philosopher and the aeronaut—and their friends start for the gasworks, and with the help of a number of workmen commence filling the balloon. Ballast, and some victuals are stowed away in the car, the instruments fixed on a board lashed across its gunwale, and the direction of the wind is anxiously noted. The balloon—we will suppose it to be a large one—gradually inflates, the wind rises, and what between the wind and the gas it is all that fifty men can do to keep the monster from breaking clean away. At last there is a cry that the balloon is full, and that the men can hold it no longer. The two adventurers jump in, their ropes and other chattels are bundled in after them, and away they go with a wide sweep which very nearly wrecks them against some contiguous chimneys. Perhaps it does, and the balloon in a few minutes comes down in a field a couple of miles off, having never got a thousand feet above the ground, with a great tear in its

side, the loss of two or three hundred pounds' worth of gas, and the breakage of the instruments and the aeronauts.

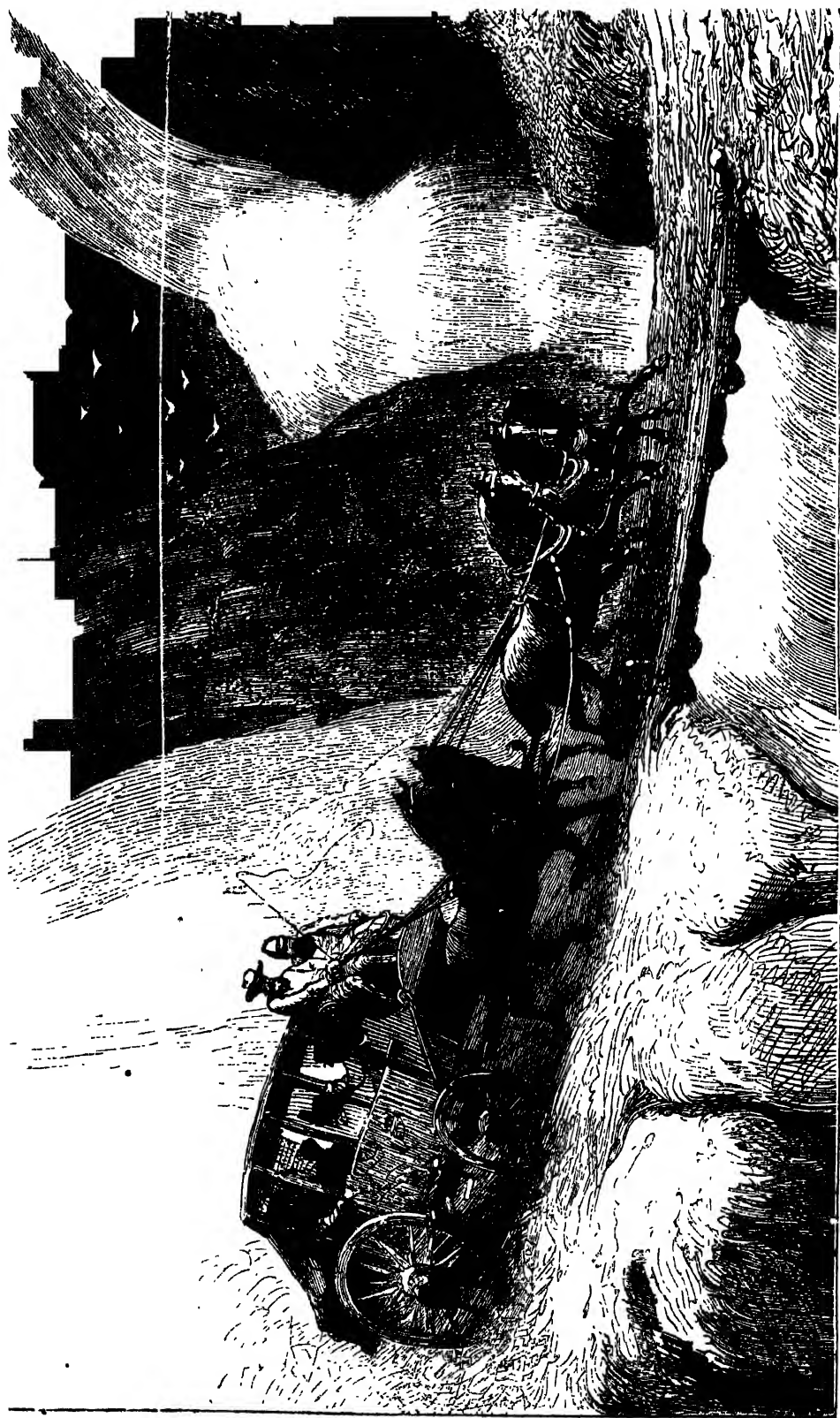
Other very frequent stumbles at the threshold may show that the balloon is rotten, that it is "full of minute holes," that it will not carry ballast enough for safety, etc. But let us suppose it gas-tight, and that the aeronaut by a liberal discharge of ballast clears trees and chimneys and shoots up into the clouds a great deal faster than he intended to a height of some 5,000 or 6,000 feet. More ballast is discharged, and up and up they go till the philosopher's face becomes of a "glowing purple," and his heart palpitates audibly. He does not mind this, but watches the falling mercury, and busily records the reading of the instruments until the aeronaut announces that the balloon is stationary, and that he can spare no more ballast, what remains being kept in hand to throw out, if necessary, on nearing the earth, so that they may fall soft.

Perhaps some *contretemps* has happened; the balloon has been gyrating, and the valve-lines become twisted, as with Messrs. Glaisher and Coxwell; or it may have passed through a snow-cloud and thence into the rays of the sun, which have melted the snow from the covering and expanded the gas, giving our travellers a most dangerous impetus upwards—an impetus which may be brought to a stop in half a minute by the bursting of the balloon with a loud report. The aeronaut and the philosopher hang on to the valve-line, gas rushes out in volumes, and the balloon falls. Presently the snow-cloud is entered again, the ropes and car and covering are clogged with snow, the fall is terribly accelerated, the snow-cloud is passed through, and the earth is seen approaching with frightful rapidity. The remaining ballast is thrown out; nevertheless the balloon takes the ground with a bump that breaks all the instruments, and after rolling and dragging and bounding along at the speed of an express train, playing leap-frog over oaks twenty yards high, tearing itself to pieces, the grapnel hooks lay hold, and it is brought up, per-

haps in the middle of a marsh. Cut and bruised and half-stunned, the aeronauts scramble out, inquire where they are, and find that they are forty or fifty miles from their starting-point, although they have not been an hour in the air. Fonvielle and Tissandier started from Paris, ascended several thousand feet, and came to the earth with terrific force, forty-eight miles away—all in the space of thirty-five minutes. Theirs was the fastest journey yet made by a balloon.

A balloon is poised in the air with exquisite delicacy. Tissandier relates that throwing out a chicken bone caused the *Neptune* to rise suddenly from twenty to thirty yards; and Lunardi's barometer fell three degrees on his casting away his hat. On sand being thrown out from a balloon rapidly descending, it (apparently) rises into the air, and, as the balloon slackens speed, falls again in a fine shower. The sea is the great bugbear of the aeronaut; to save the land he will almost drop upon it like a stone. Mr. Glaisher, who chose Wolverhampton for his favourite place of ascent, tells us that an aeronaut cannot get far enough from the sea in England, and requires all the land-room of a continent to make his voyage with freedom and comfort. Balloons have a great reputation for danger, but the 3,500 ascents which have been made have only caused fifteen deaths. The most critical moment of an air voyage is its last: to be able to take the ground well and skilfully requires the greatest presence of mind as well as thorough experience, and even then there is generally more or less of a crash.


Even in their present imperfect state balloons have done most valuable service to science, and there seems no reason to doubt that they have it in their power to render much more. Now that it is also proved that aeronauts can be of service to statesmen and generals, they will receive that attention and patronage which has long been their sorest need. Generally speaking, want of funds has compelled them to put up with many makeshifts and inconveniences which will now be remedied.



STAGE TRAVELLING IN CALIFORNIA.

A

TRIP TO THE YOSEMITE VALLEY



LIVING in the heart of the Sierra Nevada Mountains, some 207 miles south-west of San Francisco, is the beautiful Yosemite Valley. One hundred and nineteen miles of the whole distance can be made by rail to Milton, the other eighty-eight by stage coach. Yosemite, pronounced Yosem-e-te, is an Indian name, meaning Great Grizzly Bear. The valley, which is seven miles long and one wide, is 4,060 feet above the level of the sea. It is shut in by mountains on all sides, and was the last stronghold of the Indians in California, being discovered some twenty-four years ago by American soldiers, who were in pursuit of them. Two or three years elapsed, and then Mr. Hutchings, an Englishman, found it after some considerable difficulty, no one he met having a correct idea where it lay. He fell in love with the valley, and there made his home, in the course of time erecting an hotel, and drawing numerous visitors, as it became more widely known. At last he was bought out by the United States Government, who took possession of the valley, and presented it to the State of California, to be kept as a public park for ever. It contains three good hotels, which during the summer are frequently crammed with visitors; but in winter, when the valley is inaccessible, all is deserted, save by two or three men left to take care of the buildings and sweep the snow from the roofs, to prevent their being crushed.

A terribly hot day in June was drawing to a close when, having travelled over some of the roughest mountain roads in the world, our five weary horses (which had done the last fifteen miles), with the stage, and its tired and dusty load of passengers, reached

a spot bearing the euphonious name of Gin Flat, 7,000 feet above the sea, and commenced the final down grade to Yosemite Valley. The previous week had been the hottest ever known in California, and yet the snow still lay in patches here and there on each side of the track. Passing Tamarack Flat, a lovely and well-watered stretch of park-like land, the road commenced to wind round the mountain-side, becoming rougher, more steep, with sharper turns, as we proceeded, and so narrow that the off-leader continually rubbed past the bushes, or knocked the splinter-bar against the wall of rock that bounded our road on the left side. Rice, our driver, kept the horses going at the same fast trot, and I could but admire the skilful way he controlled them, and managed with his foot the lever of the powerful California brake. I had as much as I could do to hold myself on the box seat with both hands to prevent being jolted off, whilst frequent exclamations from the inside passengers informed us that some of the ladies, after taking an involuntary rise, had sat down again with rather more force than they desired.

In a few minutes we reached the Cataract, and slackened our pace to a slow walk in crossing the rickety bridge that spanned the torrent, which here came down over the rocks at an angle of forty degrees in one mass of foam about twenty-five feet wide, and so deep that scarcely any of the huge boulders in its course were visible. A little farther, and we got our first view of the valley, with the Bridal Veil Fall on the other side, glistening like silver in the rays of the setting sun, as it took its grand leap of 900 feet, in its descent spreading out like a veil; and even at our great distance we could see the beautiful rainbow which forms over it every afternoon when the sun shines. On a closer view, two days after-

wards, I saw the rainbow formed a complete circle.* From the point last-mentioned till we reached the valley, still 1,500 feet below, our road lay among and over immense masses of rock. It appears that at some remote age the precipitous sides of this mountain were shaken to pieces by some mighty convulsion of nature, and so formed the millions of stones, varying from, say, one ton to two hundred tons in weight, that lay above and below, many of which, as we looked up, seemed ready to topple over and crush us.

As we drove through the valley, the Ribbon Fall, 3,300 feet high, was on our left. In the distance it seemed very small, but the rapid streams it formed in the valley we had to ford, and then found the water come up to the axles. A little farther, and we passed El Capitan, a perpendicular rock 3,400 feet high. At length we reached a nice smooth road, and bowling along

beneath the trees, in ten minutes dashed up to Clark's Hotel, thoroughly exhausted, but in an ecstacy of delight with the magnificent and glorious scenery around us.

The next day, Sunday, was indeed a day of rest. How sweet it was to sit on the piazza reading or communing with one's thoughts, and gazing at Yo Shemite, the grandest of the falls, watch the great volume of water as it leapt from the cleft in the mountain-top, and consuming myriad shapes, spread itself in one beautiful crystal sheet over the face of the cliff, shooting out innumerable watery meteors, and swaying majestically to and fro in the wind, as it fell with thunder-like roar on the rocks 1,600 feet below, and running down among them for some considerable distance, gathered itself together for its grand final leap of over 600 feet to the valley. Words and picture can give but a faint idea of the wondrous grandeur and beauty of Yosemite Falls.

THE SACK OF ROME.



APERIOD of six hundred and twenty years had elapsed since Hannibal had encamped on the banks of the Anio just outside the walls of Rome. The Romans had then, with characteristic fortitude, marched a body of troops out of the opposite gates to reinforce the army in Spain, and putting up to auction the ground on which the enemy's camp was pitched, had sold it at the ordinary market price. The Carthaginian general was compelled to raise the siege, and since then no foreign foe had appeared before its walls.

But the cup of its iniquities was full. The time foretold by prophets had come. And now the Romans were to suffer those calamities which they had dealt out so pitilessly to others. Honorius was the reigning emperor when the Goths, under

Alaric, encompassed the walls, watched all the gates, cut off supplies from the country, and commanded the navigation of the Tiber. The Romans had long been trying to forget in luxury and excess the dangers with which they were surrounded. For awhile they exhibited haughty surprise and indignation, and wondered that vile barbarians should dare thus to insult the capital of the world. Soon their necessities taught them humbler language. At first they were reduced to scarcity, and soon the scarcity became a famine. The doomed city now underwent all the horrors of a siege. Treasures of gold and silver were expended in the purchase of the scantiest and vilest food. Many thousands died of starvation, and, as at the siege of Jerusalem, it is even said that mothers were forced by famine to kill and eat their own children. At last they were compelled to

throw themselves upon the clemency of Alaric, and sent ambassadors to negotiate with their barbaric enemy.

The ambassadors delivered their message in a haughty manner. They declared, in language very little suited to their condition, that the Romans were determined to maintain their dignity both in peace and war. They told Alaric that if he refused them an honourable capitulation, he might sound his trumpets and give battle to an innumerable army animated by despair. "The thicker the hay the easier it is mowed," was the grim reply of the Gothic king. This foreboding language was accompanied by a loud insulting laugh from the conqueror, who knew how to estimate the starved, effeminate Romans at their proper worth. He then condescended to state what he would consent to receive as the price of his retreat from the city. His conditions were as follows:—He must receive *all* the gold and silver in the city, whether it belonged to the State or to private individuals; *all* the rich and precious movables; *all* the slaves who could show that they were barbarians. The ambassadors were now thoroughly humbled. "If such, O king," they answered, in suppliant tones, "are your demands, what do you intend to leave us?" "YOUR LIVES," answered the haughty conqueror. The ambassadors trembled, and retired.

Alaric fixed a ransom, and for a season the beleaguering army withdrew its deadly grasp and marched into Tuscany. But it was only for a season, and the last condition of Rome was worse than the first. For the people mistook their case, and fancied the barbarians had gone away through fear. And so when Alaric demanded reparation for the insults that had followed him, and for the unscrupulous violation of the conditions of peace, Honorius arrogantly bade him forthwith to evacuate all the lands of the empire. Alaric came back to Rome. This time the Goths stormed the city without waiting to besiege it.

And such a storm! They entered the Eternal City at midnight. The Salarian

Gate was thrown open, and the flood of hostile forces poured in. Houses were fired on either hand. In the disorder of the night the flames spread, and burnt down public buildings and private palaces. A contemporary historian asserts that the wrath of heaven supplied an additional terror, and that the Forum, populous with temples and the statues of gods and heroes, was blasted with lightning. The full horrors of that dreadful night, when barbarians and Romans in their death-struggle fought amid the crackling of fires and falling-in of those narrow streets—for the Roman streets were narrow and overlapping—can have been known only to such as bore part in the bitter broil. Many believed that it was from national neglect of the temples and priestly worship—for pagan ceremonies were forbidden in Rome—that the gods had rained these calamities upon the city. Others sneered at the Christians, and said their God in whom they trusted was not able to help them. To these latter, it seems, St. Augustine addressed his great work, *De Civitate Dei*, from which many glimpses of the internal condition of Rome during the siege may be got.

For six days this terrible sack went on. With the citizens often despair provoked a furious resistance; and then revenge was close at hand—reprisals, promiscuous massacre of the innocent and helpless, and violence and outrage of every kind. Pillage was universal, all Rome being flooded with the barbarians. Gold and jewels and treasure that would go in small compass were sought for, and every house was searched and searched again. Palaces were stripped of all their splendour. Costly furniture, sideboards of massy plate, silk, and purple, were piled into the wagons that followed in the wake of the barbarian army. Many a fine statue the Goths melted down for the sake of the precious metal. Threats and blows forced confession of hidden treasures. "Some Christians," writes Augustine, "were put to the torture, to the end that they might discover where their goods lay. But the true good, where-

by they themselves were good, they could neither lose nor discover. Christ enriches the martyr with everlasting felicity. No man that ever confessed Christ could lose Him amongst all these torments. As for these, their minds took a loftier pitch, beholding both the possession and affection of earthly riches with an eye of scorn. They lost all they had! What? Their faith, their zeal? These are Christian riches. He that is rich before God, what can man take from him? These are the treasures of which Christians are opulent. What have the Christians endured in this sack of Rome that turns not to their profit, if we rightly consider it? The extremity of famine, they say, destroyed many. Well, but they who patiently went through it have made good use of it. For such as the famine slew, it delivered from the evil of this life. A bad death can never follow a good life. For there is nothing that makes death bad but that estate which followeth death. And what power hath the horror of death to affright their souls who have led a virtuous life?"

After this six days of sack, the barbarians, laden with spoils, evacuated Rome—poured out along the Appian Way, wandering at will until they took up their summer quarters in Southern Italy. There in that lovely land these rough northerners made themselves at home. Farms, and villas, and garden-like uplands, were pleasanter than encampments outside Rome. They spared nothing. The historian says, "The fruits of a long peace perished under the rude grasp of the barbarians, who themselves were incapable of tasting the elegant refinements of luxury which had been prepared for the use of the soft and polished

Italians. Each soldier claimed his share of the corn and cattle, oil and wine, daily brought into the Gothic camp, and the principal warriors insulted the villas and gardens once inhabited by Lucullus and Cicero along the beautiful coast of Campania. Their trembling captives, the sons and daughters of Roman senators, presented in goblets of gold and gems large draughts of Falernian wine to the haughty victors, who stretched their huge limbs under the shade of plane-trees artificially disposed to screen the scorching rays and admit the genial warmth of the sun. These delights were enhanced by the memory of past hardships."

The city was again given over to plunder, eleven centuries after its memorable sack by the Goths, in the days of Charles V. The occupation lasted for nine months, during which the most atrocious deeds of cruelty, rapine, and lust, were perpetrated. In this storming of Rome, Pope Clement VII. shut himself up in the Castle of St. Angelo. By the time that his conquerors set him at liberty, he was reduced to the extremity of eating asses' flesh—all that remained between him and starvation. Insulting conditions of surrender were forced from him; as for the wretched inhabitants of the city, they were subjected to the utmost suffering. Since then the city has been often besieged. It was taken by the French on June 30, 1849, and again by the Italian army September 20, 1870. But the nations are no longer convulsed with the shock of its overthrow. It was a crumbling rampart that slid down into the river of time, and the waters have closed over it without eddy or ripple.





LION STORIES.

THE following vivid account of a man-eating lion is given by the great African traveller, the Hon. W. Drummond :—

“Some lions make a point of attacking every human being they meet, without provocation or apparent cause ; but these, as a general rule, are man-eaters, no instance of their otherwise doing so having come within my personal knowledge, and only one, well authenticated, having been

told me by native hunters. The man who first related the story to me, and who was an eye-witness of it, was then living in Natal, having retired upon his earnings ; but some time afterwards, when passing by the place where he described it as having occurred, I found it corroborated in every particular by the natives of the district.

Three hunters had started together from the colony for the Amatonga country to shoot ivory for their European employer, and after having been absent for nearly

eighteen months, were on their way back, and instead of, as usual, taking the coast road and passing through Somkeli's country, they made for the Pongolo Pass, having heard of some disturbances in Zululand, which made them doubt their being able to get through it safely. On the day on which they left the last Amatonga kraals, the people there strongly warned them not to pass by a certain reed-margined lagoon which otherwise lay in their most direct route to the pass, saying it was frequented by a savage lion which had already killed, though it had not eaten, two passers-by, and had on several occasions given vindictive chase to others. However, as lions at that date and in that part were very numerous, hunting in troops of even thirty individuals, and these hunters had been meeting them with mutual respect and forbearance on nearly every day of the eighteen months of their expedition, they thought very little of the warning, and took that very path.

They had reached the lagoon, and were passing within five or six yards of the edge, when, without further warning than a slight rustle, a lion sprang upon the foremost, crushing him to the ground. His terrified comrades, throwing away the chance of shooting the brute while it was still upon its first victim, and his eyes probably closed, rushed to the nearest tree for safety; but, once there, feeling ashamed of their cowardly desertion of an old companion, they descended, and walking forward together, were just on the point of firing, when, with a roar that almost deprived them of the power to run, the lion charged, caught the hindmost, and after shaking him for a second or two, gave chase to the other, who, however, had profited by the time to remove himself, by a bare foot or so, out of reach of the spring the enraged animal gave as it saw that one had so far escaped. It then returned to its last victim, not yet dead, took him up in its mouth, dropped him, tossed him from paw to paw as a cat does a mouse, and at last, as if wearied at so much unaccustomed gentle-

ness, it allowed its savage nature to gain the mastery, and with one crunch of its powerful jaw put him out of his pain.

It next came back under the tree where the sole survivor of this fearful tragedy was, and looking up at him in a complacent manner, evidently aware that though it might not be able to reach him at present, it could at least keep him a prisoner during its pleasure, quietly stretched itself on the ground, and after licking its great paws for a few minutes seemed to be asleep. The tree—one of the larger mimosas—in which the wretched man was thus confined, had two principal stems separating from the main one about six feet from the ground, into the fork of which he had thrown his gun when he climbed up, and after a lapse of a quarter of an hour without any sign of consciousness on the part of the lion, he could not help his thoughts reverting to it, and to how easily the brute might be shot if he could once obtain possession of it, and after another ten minutes, to see whether the animal would make any movement, he determined to try and reach it. Silently and quietly he moved down, foot by foot, until only such a distance intervened between him and his prize as could be overcome by stooping; but while in the act of doing so a gentle, and without doubt a perfectly involuntary, vibration of the brute's tail warned him that he was observed. He had presence of mind enough to know that any hurried movement would precipitate its spring, while he was equally aware that no time was to be lost; so, abandoning the gun, he quietly straightened himself, feeling with his upraised hand for a branch to trust to, while his eyes never left the lion's body. He was not a second too soon, for as his hand found and grasped the support it sought, his treacherous adversary bounded upwards, not in time to catch him indeed, but so nearly that he could feel the rush of the displaced air.

The disappointed brute roared furiously with rage at this second defeat, but wasting no further time when it saw it was useless,

stalked away, took up the body of the man it had last killed, and having carried it to the other, lay down beside them both. A few minutes afterwards it was saluted with a six-to-the-pound bullet in its ribs, making it roar as only a wounded lion can, and charge up to the tree in hot haste. Of course, such a large-bored elephant gun was only a single barrel, and before it could be again loaded the savage beast had disappeared in the reeds, though, one is thankful to think, carrying its death-wound as a reward for its unprovoked attack."

People in Tunis, Africa—at least, some of the older people,—often talk of the wonderful exploits of a lion-killer who was famous there forty years ago. The story is this, and is said to be entirely true. The lion-killer was called "The Sicilian," because his native country was Sicily; and he was known as "The Christian" among the people in Tunis, who were mostly Arabs, and, consequently, Mohammedans. He was also called "Hercules," because of his strength. He was not built like Hercules, however; he was tall, but beautifully proportioned, and there was nothing in his form that betrayed his powerful muscles. He performed prodigies of strength with so much gracefulness and ease as to astonish all who saw him. He was a member of a travelling show company that visited Tunis, very much as menagerie and circus troupes go about this country now from town to town. His part of the business was not simply to do things that would display his great strength, but also to represent scenes by pantomime, so that they would appear to the audience exactly as if the real incidents were being performed before their very

eyes. In one of these scenes he showed the people how he had encountered and killed a lion with a wooden club in the country of Damascus.

This is the manner in which he did it. After a flourish of trumpets the Sicilian came upon the stage, which was arranged to represent a circle or arena, and had three palm trees in the middle. He was hand-



somely dressed in a costume of black velvet, trimmed with silver braid, and as he looked around upon the audience with a grave but gentle expression, and went through with the Arabian salutations, which was to bear his right hand to his heart, mouth, and forehead successively, there was perfect silence, so charmed were the people with his beauty and dignity. Then an interpreter cried. "The Christian will show you

how, with his club, he killed a lion in the country of Damascus!" Immediately following this came another flourish of trumpets and a striking of cymbals, as if to announce the entrance of the lion. Quickly the Sicilian sprang behind one of the three palms, whence to watch his enemy. With an attentive and resolute eye, leaning his body first to the right and then to the left of the tree, he kept his gaze on the terrible beast, following all its movements with the graceful motions of his own body, so naturally and suitably as to captivate the attention of the spectators.

"The lion surely is there!" they whispered. "We do not see him, but he sees him! How he watches his least motion! How resolute he is! He will not allow himself to be surprised!" Suddenly the Sicilian leaps: with a bound he has crossed from one palm tree to another; and, with a second spring, has climbed half-way up the tree, still holding his massive club in one hand. One understands by his movements that the lion has followed him, and, crouched and angry, stops at the foot of the tree. The terrible club makes a whistling sound as it swings through the air, and the lion falls to the ground.

The scene was so well played that the wildest applause came from all parts of the audience. Then the interpreter came in, and throwing at the feet of the Hercules a magnificent lion's skin, cried, "Behold the skin of the lion that the Christian killed in the country of Damascus!"

The fame of the Sicilian reached the ears of the Bey of Tunis, but the royal dignity of the Bey, the reigning prince of that country, would not allow him to be present at exhibitions given to the common people. Finally, however, having heard so much about the handsome Sicilian, he became curious to see him, and said, "If this Christian has killed one lion with a club, he can kill another. Tell him that if he will knock down my grand lion with it, I will give him a thousand ducats," quite a large sum in those days, a ducat being about equal to four shillings. At this time the Bey had

several young lions that ran freely about in the courtyard or garden of his palace, and in a great pit entirely surrounded by a high terrace, on a level with the ground floor of the palace, a superb Atlas lion was kept in royal captivity. It was this lion that the Bey wished the Sicilian to combat. The proposition was sent to the Sicilian, who accepted it without hesitation, and without boasting what he would do.

The combat was to take place a week from that time; and the announcement that the handsome Sicilian was to fight a duel with the grand lion was spread far and wide, even to the borders of the desert, producing a profound sensation. Everybody, old and young, great and small, desired to be present. Moreover, the people would be freely admitted to the garden of the Bey, where they could witness the combat from the top of the terrace. The duel was to be early in the morning, before the heat of the day.

During the week intervening, the Sicilian performed every day in the show, instead of two days a week, as had been his custom. Never was he more calm, graceful, and fascinating in his performances. The evening before the eventful day, he repeated in pantomime his victory over the lion near Damascus, with so much elegance, precision, and suppleness, as to elicit round after round of enthusiastic cheers. Of course, everybody who had seen him *play* killing a lion was wild with curiosity to see him actually fight with a *real* lion.

So, on the following morning, in the early dawn, the terrace around the lion's pit was crowded with people. For three days the grand lion had been deprived of food in order that he might be the more ferocious and terrible. His eyes shone like two balls of fire, and he incessantly lashed his flanks with his tail. At one moment he would madly roar, and the next rub himself against the wall, vainly trying to find a chink between the stones in which to insert his claws. Precisely at the appointed hour, the princely Bey and his court took the places that had been reserved for them on one side of the terrace. The Sicilian came

a few steps behind, dressed in his costume of velvet and silver, and holding his club in his hand. With his accustomed easy and regular steps, and a naturally elegant and dignified bearing, he advanced in front of the royal party and made a low obeisance to the Bey. The prince made some remark to him, to which he responded with a fresh salute. Then he withdrew, and descended the steps which led to the lion's pit.

At his appearance in the pit, a silence like death came over the crowd of spectators. The Hercules walked rapidly towards a corner, and leaning upon his club, awaited the onslaught of the lion, who, blinded by fury, had not yet perceived his entrance. The waiting was of short duration, for the lion, in turning, espied him, and the fire that flashed from the eyes of the terrible beast told of savage joy in finding another victim.

Here, however, the animal showed for a moment a feeling of anxiety. Slowly, as if conscious that he was in the presence of a powerful adversary, he retreated some steps, keeping his fiery eyes all the time on the man. The Sicilian also kept his keen gaze on the lion, and, with his body slightly inclined forward, marked every alteration of position. Between the two adversaries it was easy to see that fear was on the side of the beast; but in comparing the feeble means of the man—a rude club—with the powerful structure of the lion, whose bounding made the very ground beneath him tremble, it was hard for the spectators to believe that courage and not strength would win the victory.

The lion was too excited and famished to remain long undecided. After more backward steps, which he made as if gaining time for reflection, he suddenly advanced in a sidelong direction in order to charge upon his adversary. The Sicilian did not move, but followed with his fixed gaze the motions of the lion. Greatly irritated, the beast gave a mighty spring, uttering a terrible roar, the man, at the same moment, leaped aside, and the lion had barely touched the ground when the club came down upon his head with a dull shocking thud. The king of the desert rolled heavily under the stroke, and fell headlong, stunned and senseless, but not dead.

The spectators, overcome with admiration, and awed at the exhibition of so much calmness, address, and strength, were hushed into profound silence. The next moment the Bey arose, and with a gesture of his hand, asked mercy for his favourite lion.

"A thousand ducats the more if you will not kill him," he cried to the Sicilian.

"Agreed," was the instant reply.

The lion lay panting on the ground. The Hercules bowed at the word of the Bey, and slowly withdrew, still keeping his eyes on the conquered brute. The two thousand ducats were counted out and paid. The lion shortly recovered.

With a universal gasp of relief, followed by deafening shouts and cheers, the spectators withdrew from the terrace, having witnessed a scene they could never forget, and which is still talked of in Tunis.



REMARKABLE CATHEDRALS.



AMONG the numerous cathedrals which have been considered remarkable for their dimensions, their architecture, or the richness of their decorations, that of St. Peter's at Rome is, beyond all comparison, the most magnificent. The first stone was laid by Pope Julius II. in 1506, the main body of the edifice was completed in 1614, and the colonnade added in 1667. The extreme inside length of the building, which is in the form of a Greek cross, is 607 feet; the length of the transepts 445 feet; and the height, from the floor to the cross which surmounts the cupola, 458 feet. "So vast are its dimensions," says Maclaren, "that colossal statues and monumental groups of figures are stowed away in its aisles and recesses, without impairing the unity and simplicity of the plan, as they do in the St. Paul's of London. Comparing it with the British cathedral, which, though *longo intervallo*, may well claim to be the second in the world, the floor of St. Peter's covers about five English acres (nearly the size of the Colosseum), while that of St. Paul's occupies only two acres; and the actual bulk, or entire contents, of the former as compared to the latter, are as four to one. And taking into account the number and splendour of the decorations of St. Peter's, we need not wonder that it is supposed to have cost, with its monuments, gilding, and embellishments, from twelve to sixteen millions sterling; whereas the cost of St. Paul's did not exceed £750,000! In the interior of these two noble buildings, the difference is scarcely less striking than between one of our old barn-like meeting-houses and the most elegant of our modern Episcopal churches;

but as regards the exterior, all admit that in symmetry, purity of design, and true architectural beauty, the English is superior to the Roman temple." The extreme inside length of St. Paul's is 510 feet, the length of the transepts 283, and the height to the cross 365 feet—an altitude which is greatly exceeded by the spire of Salisbury Cathedral, 404 feet.

Milan Cathedral is the largest and richest of all the churches erected in the middle ages; and it is one in which the architect planned to cover the largest possible space from the fewest points of support. The interior has double rows of aisles on each side of the nave, thus giving a magnificent width to the structure. Being erected between 1385 and 1440, it exhibits all the richness of architecture of that florid period. Not only is it the largest of all mediæval cathedrals (covering 108,000 square feet), but it is almost unparalleled for beauty of effect, being built wholly of white marble. The decoration is most lavish, the whole of the exterior being adorned with tracery and sculpture of the richest kind. The cathedral is 493 feet long, and 356 feet high to the top of the spire. The marble statues are said to amount to the almost incredible number of 4,400!

The cathedral, or *Duomo*, of Florence, begun in 1296 and finished in 1426, is about 500 feet in length, and 384 in height to the top of the cross; its cupola is said to have furnished Michael Angelo with the first idea of that of St. Peter's. The well-known cathedral of Strasburg has an interior length of 378 feet, and the height of its spire 474 feet, being, if the dimensions be accurate, little less than that of the Great Pyramid of Egypt. This spire is open work, and combines, with the most perfect solidity, extraordinary lightness and elegance.

St. Sophia, at Constantinople, was built by the Emperor Justinian about 535 A.D., on the site of a small church which had been built by Constantine. It is nearly an exact square in plan, being 250 by 235 feet, exclusive of projections called the narthex and the apse. The exterior is more remarkable for stability and majesty than for beauty; but the interior is famed for its dome. This dome is very little lower than a hemisphere, being 107 feet diameter by 46 feet high. Beyond the great dome, east and west, are two semi-domes, of a diameter equal to the great dome; and these are again cut by two smaller domes. All the pillars are of porphyry, verd antique, or rich marble; all the flat surfaces are covered with a mosaic of beautifully varied slabs of marble; and all the domes, roofs, and other curved surfaces, with mosaics on a gold ground. The effect of the dome, semi-domes, and quarter-domes, has been to give to the centre of the church the character of a gorgeous hall 250 feet long, 100 wide, and 180 high--proportions which no Gothic architect has since attempted to equal.

St. Petersburg contains one of the largest and most costly churches in Europe; though architectural critics are divided in opinion as to its artistic merits. It stands in a magnificent square, bounded by the Neva on one side, and by large public buildings on the other three sides. This cathedral or church, St. Isaac's, is the third which has occupied the site. It was begun by the Emperor Alexander I. in 1818, and finished by Alexander II. in 1858, one architect, Montferrand, having superintended its construction from first to last. The cathedral is a rectangle, 305 feet by 166; it covers a much smaller area than St. Paul's, and therefore, regarded as a cathedral, is far from large; but it is certainly to be ranked among the largest of churches. It has the unusual feature of four magnificent porticoes, one in the centre of each front; these are octastyle Corinthian, and have rich alto-relievi in the pediment. Two towers flank the principal

façade; two others flank the opposite side; and in the centre of the whole mass is a dome. The porticoes are considered to be the finest that have been erected in any part of Europe since the time of the Romans. Each column consists of one single piece of the most beautiful rose-coloured granite, 56 feet in height by $6\frac{1}{2}$ diameter. The entablature and nearly the whole exterior of the building are faced with granite. The drum of the dome is surrounded by a peristyle of twenty-four equidistant columns, each being a monolith of red granite. The four towers, or cupolini, are bell-towers, the Russians being famous for bells in their ecclesiastical arrangements. The interior of the church is absolutely crowded with magnificence; malachite and marble, painting and gilding, sculpture and ornament, are carried to such an excess as absolutely to weary the eye, and destroy all idea of repose.

Every country in Europe, with few exceptions, is rich in specimens of cathedral architecture, especially England, France, Germany, and Italy. We can only notice one more in these brief pages. The greatest recent work of this kind in Europe is unquestionably Cologne Cathedral. The old structure, consisting of little more than the choir, was in progress from the thirteenth to the sixteenth century, since which time the works remained dormant till the beginning of the present century, when the Germans throughout the "Fatherland" took up the matter with much enthusiasm. Associations were formed, not only over the whole of Germany, but elsewhere in Europe, to collect funds for achieving the noble work; and the successive kings of Prussia have taken a lively interest in the work. The nave, aisles, and transepts, were finished in 1848; the portals in 1859; the central spire in 1860; and all the other parts are now finished except the great towers, at an expense of three-quarters of a million sterling. When finally completed, the cathedral will be 511 feet long, 231 broad, and nearly 500 feet high. The whole is in the purest style of Gothic.

America has made one approach to the style of St. Peter's, so fine as to obtain for it the character of being the noblest ecclesiastical building in the New World. This is Mexico Cathedral, begun in 1573, but not finished till 1657. It is 504 feet long, and 228 broad. The western façade presents two bold towers 305 feet high. The dome is curiously placed, being near the east end, an arrangement which some authorities consider to give a magnificent

interior vista. The next best ecclesiastical building in America is Arequipa Cathedral, Peru, built about two centuries ago, nearly destroyed by fire in 1844, and since rebuilt on much the same plan as before. The façade is of very considerable extent, and divided into five compartments by Corinthian pillars standing upon a low basement, but supporting only a fragment of an entablature. Of recent years church architecture has made a great advance.



THE PILGRIMAGE TO MECCA.

MOHAMMED has left in the Koran, as one of its solemn commands, the injunction, "Perform the pilgrimage to Mecca!" and its observance is held to be binding on all the millions of the human race who practise the faith of Islam. The great object sought in making the pilgrimage is to "ask pardon of God" in the "first house appointed unto men to worship in," where Abraham and Mohammed received revelations from heaven, and where "whoever entereth 'herein' shall, for this life, and for that which is about to come, 'be safe.'" In issuing this paramount injunction Mohammed was evidently desirous of making Mecca a central point of union in which all Mohammedans might congregate for the subjugation of the world, and for the acquisition of its material wealth.

Mecca, the seat of the Mohammedan theocracy, is a Turkish city on the western coast of Arabia, about half-way down the Red Sea, from which it is reached through the port of Jeddah. It is venerated as the spot on which Abraham and Ishmael are said to have erected the Caaba, or the First House of God, and which Mohammed adopted as the Temple of all True Believers. The great Court of the Temple is a

large open area in the midst of the city, surrounded by piazzas, enclosed by massive walls, adorned by lofty minarets, and approached by nineteen sacred gates. In the centre stands the Beit Allah, the Holy of Holies, covered with rich black damask, embroidered with gold, formerly presented new every year by the Khalifs, afterwards by the Sultans of Egypt, and now by the Sultan of Turkey. After the Caaba, the chief objects of religious regard are the "Stones of Abraham," on which he is recorded to have stood during the building of the Caaba, and on one of which his footprints are stated to be still visible. Others within the sacred precincts are the Well of Hagar and the Tombs of Ishmael and Hagar. In the neighbourhood of the city are Mount Safâ and Mount Merwâ, between which Hagar and her son are supposed to have suffered want of water; the valley of Mina, in which Abraham's faith overcame temptation; and Mount Arafat, where, according to Arabic tradition, Adam repented of his transgression.

Memorials of this character are held to be of such infinite value that visits to them are not only regarded as acts of filial reverence, but as certain means for obtaining, as declared in the Koran, "visitation of God." Hence every Mussulman longs for the beatific visions which Mecca is believed by him to afford. "See Damascus, the beauti-

ful," cried Mohammed, "and die!" "See Mecca, the heavenly," he cries again, "and live, for it is the 'Gate of Paradise!'" In fulfilment of this mandate, multitudes of devotees from all the more southern regions of the Old World seek, every year, the promised blessings of Mecca, and multitudes perish from the hardships of the ways that lead to them.

The great routes by which the pilgrims reach Mecca are by land or sea, or by a combination of both.

The Egyptian route is from Cairo, on the track taken by the ancient Israelites, across the desert to Suez, and from thence across the "great and terrible wilderness" of north Arabia to Akaba, at the head of the eastern branch of the Red Sea. Striking southward, it proceeds through the desolate and dangerous regions of west Arabia, until at length, after a journey of 1,000 miles, the sight of Mecca, "the inviolable," gives to the pilgrims hope of rest and safety. The trials to which "faith" is exposed on the journey are almost beyond endurance. Fatigue kills many. Thirst destroys many more. Ablution and cleanliness are impracticable. The caravan, as it toils its slow length along, scorched by the sun, suffocated by the dust, and followed by the furnished vulture, is a moving miasma. But the caravan, while it parts with its living load, gets richer as it goes. The treasures of the dead pilgrims swell the money bags and distend the wallets of survivors to an extent which enables the stronger members of the diminished host to devote larger funds to the service of alms, feasts, and sacrifices, in Mecca, than would, in weaker hands, have been regarded as prudent or possible.

The Syrian route is from Damascus, running in its course along the range of mountains which forms the eastern side of the valley of the Jordan, and passing through the old countries of Moab, Ammon, and Midian.

Leaving the trans-Jordanic regions, it

traverses the great central desert of Arabia, proceeding to Dar Ayyah, and thence, after a journey of nearly 1,500 miles, to Mecca. This extraordinary journey, which, for the greater part, passes between sterile mountain ranges and over immense sandy wastes, is not less perilous or less fatal in character than that which sadly distinguishes the Egyptian route. The sufferings and mortality of the pilgrims exceed in degree those of the average calamities of war, and are only to be matched in the records of famines and pestilence. The wearied caravan arrives at Mecca despoiled of much of its living freight; and, of the victims who have survived, numbers, weakened by disease, fail to obtain strength for the due observance of the exhausting ceremonies of the holy festival, which consist in rapid marches round the Caaba, runnings between Safa and Merwa, throwing stones at evil spirits, ascents of Mount Arafat, and tumultuous sacrifices of sheep, goats, kine, or camels, in the valley of Mina.

The principal marine routes are those followed in the voyages from the North African ports of Morocco, Algeria, Tunis, and Tripoli, to Egypt; the voyages from Constantinople, the ports of Turkey; and the voyages from India, Persia, and the east coast of Africa. The passages by these routes, being mostly undertaken in sailing vessels, ill-appointed and of small capacity, are tedious, dangerous, and in all respects most unsatisfactory.

To remedy the evils which at present attend the pilgrimage to Mecca, and to promote the good which it is capable of effecting, are not only humane objects, but they are of much commercial value and importance. The saving of human life is the first instinct of civilisation, and the promotion of its well-being is successfully sought through the instrumentality of commercial intercourse. The pilgrims trade as they travel. Mohammed says to them, "It shall be no crime in you to seek an income by trading during your pilgrimage."

IRONCLAD SHIPS.



IRON ships of war are not pretty to look at,—that is plain, without argument. But they have a magnificence of strength which constitutes a beauty in itself; and one cannot but feel, when looking at them, that even if they are ugly, they are so because they typify in the highest degree the spirit and the power of horrid and unchristian war.

The beauty of their strength is a thing apart, and it is in this light that we would fain have our readers regard them. Our sense of national security will be largely increased after an inspection of these ships; and when we consider that *Devastations* and *Thunderers*, under the British flag, are intended to represent the order-keeping policeman rather than the aggressive soldier, we shall conclude that if there are to be police at all, it is better to have them irresistible, and that the surest way to insure the house against violence is for a strong man armed to keep it. The type of the strong-armed man who is to keep foes from these shores, is well shown in the *Devastation*, most aptly named. This ship is at the time of writing the most powerful war-ship in commission, whether in English or foreign waters. In company with her sister ship, the *Thunderer*—on board of which took place a terrible boiler explosion—she would be a match for any number of broadside ships that liked to attack her; and when these mighty ones are supplemented by the yet heavier-armed *Dreadnought*, and by the *Inflexible*, built on much the same pattern, but armed with 81-ton guns instead of 35 and 38-ton guns, they will be able to show front against any possible combination of foreign navies.

It is remarkable to what great perfection naval architects have attained in construct-

ing these ships, when it is borne in mind that only fifteen years have elapsed since the first attempt was made to build on the turret plan. After much debate and many doubtings, the order was given, in 1862, to adapt the *Royal Sovereign* as a turret-ship, on the principle so long advocated by the late Captain Coles. Deep was the grief which the order inspired among the devotees of broadside ships, and deep also was the regret with which admirers of the old lines of beauty in a ship saw the fine three-decker cut down and converted into a floating battery. In the *Prince Albert*, an iron ship then under construction, turrets were introduced, and these ships, with their fine fixed turrets and their guns drawn inboard, were the earliest specimens of the new style.

It is foreign to the purpose of the present paper, even if the limits of an article gave the space, to describe the successive changes which took place in the design of turret or "monitor" ships in the interval. It may be as well, however, to state that the number of turrets has been reduced in all the more recent ships to two, and that mobility of the turret, so as to give an opportunity of firing sideways or fore-and-aft, has superseded the idea of fixed turrets. To compensate for the reduced number of guns, cannon of larger weight have been given; while the resisting power of the ship has been enormously increased by the growth of the armour, from four and a half to eighteen inches, in thickness. Masts, spars, and sails have vanished from the decks of these great war-ships, and superstructures calculated to catch the wind, retain the in-thrown sea, and to give a better target to an enemy, have also disappeared.

Though there are ships which combine the turret principle with sailing power (as in the *Monarch*), experience has shown that they are poor sailers and embarrassed fighters; and the fate of the unfortunate *Captain*,

which was a ship of this kind, went seriously to impair confidence in the plan. In carrying out the idea to its full extent, it was found necessary to carry it out in one direction only, and to depend wholly on the engines as the motive power of the ship. The care of naval architects was then confined to devising a ship which should be so protected in all vulnerable parts as to enable it to withstand the fire of the most powerful artillery; at the same time that it was furnished with the means of moving speedily about, and of inflicting the greatest amount of injury capable of being compassed by the heaviest guns.

Upon this plan vessels of the *Glutton*, *Cyclops*, *Magdala*, and *Abyssinia* class were built, with fair speed, but very light draught of water, for the purpose of lying close in shore, and defending harbours, creeks, and rivers. Indeed, it was thought at one time that the use of mastless turret-ships would be confined exclusively to this object, and that it would be perfectly impossible to send them to sea. But the designers of the *Devastation*, *Thunderer*, *Dreadnought*, and *Inflexible* had other opinions, at least to this extent, that they have been able to provide a ship capable of going fourteen knots an hour, capable of stowing 1,600 tons of coal, and capable of carrying, behind the thickest armour used, four of the huge 81-ton guns, whose exploits at Shoeburyness excited so much wonder. Further, they have succeeded in enabling such monsters to go to sea with perfect safety; and though it is probable that ships dependent for their motive power on their engines only will never be allowed to go ocean-cruising alone, the *Devastation* has proved her ability to go unaided from Portsmouth to Malta, and to face seas in the Mediterranean which other ships would regard as formidable. She has ridden out gales in perfect safety, and is pronounced by those on board to be more comfortable, and less liable to pitch or roll, than ships with high bulwarks, masts, or other projections into the air. As adjuncts to a fleet, such ships are

simply invaluable, and of all our ironclads, none has as yet more thoroughly represented British force and determination than the ship of which we write.

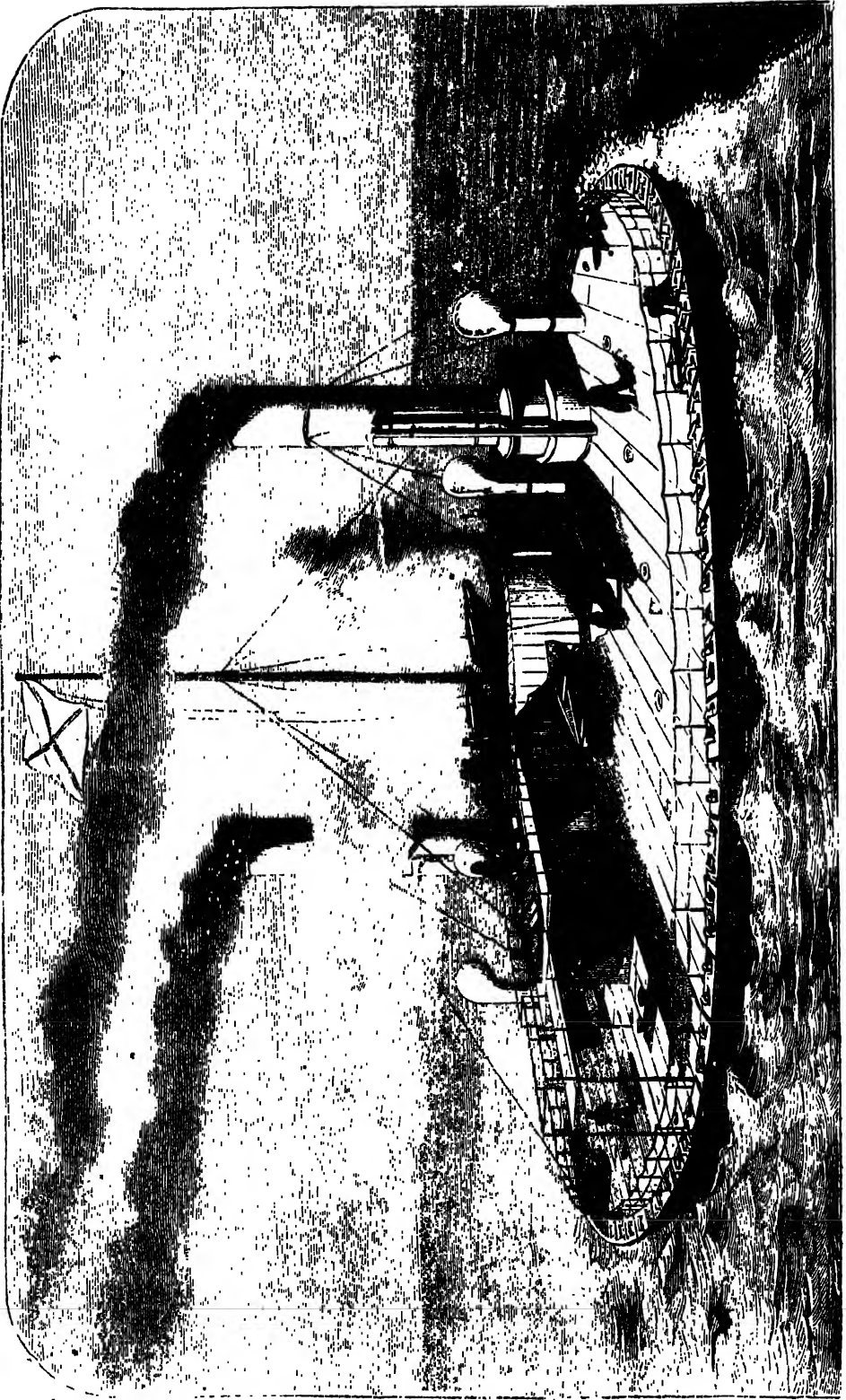
The principal dimensions of the *Devastation* are as follows:—

	Feet.	In.
Length between the perpendiculars	285	0
Extreme breadth	62	3
Depth in hold	18	0
Burden in tons, 4,406.		
Draught of water (forward)	26	3
„ „ (aft)	27	1
„ „ (mean)	26	8
Displacement in tons, 9,298.		
Height of port-sills from load water-line (fore turret)	12	11
„ „ „ (after turret)	12	7
Height of upper deck at side, from load water-line (forward)	8	6
„ „ „ (amidships)	10	9
Engines—Indicated horse-power, 6,633.		
Speed per hour, in knots, 13·84.		

The thickness of her armour ranges from ten to twelve inches on sides and breast-work, and from twelve to fourteen in the turrets. She can carry 1,600 tons of coal—enough to take her to America and back; she is armed with four 35-ton guns, capable of firing shot and shell weighing 700lbs. each, at a velocity equal to about 900 miles an hour; and she is manned by a complement of 329 officers and men. The total weight of her armour is 2,581 tons, and her total displacement, with guns, stores, and equipment, is equal to 9,298 tons.

Some idea of the cost of these vessels may be gathered from the fact that the *Dreadnought* (late *Fury*), which is of the same type, but thirty-five feet longer than the *Devastation*, cost for her hull £400,000; her engines cost £70,000; her boilers £30,000; and there is the value of guns, ammunition, and stores to be added to these sums. Yet the cost of the *Devastation*, exclusive of artillery and stores, fell short of the cost of the *Minotaur*, by £140,000, and of the *Monarch* and *Hercules*, by £40,000, so costly is the luxury of being well defended.

With such powerful means of keeping off the foe, or of attacking him in his own seas,



RUSSIAN CIRCULAR IRONCLAD.

it may well be asked what foreign nations have done in the same way. The Americans, from whom the first idea of a monitor or ironclad battery came, have a few ships of the class; but they are on an antiquated model, and quite unable to cope with the ships of which we are writing. The French and Germans have not yet launched out into this kind of construction, and the few specimens owned by the Dutch and Italians are at present not formidable. The Italians have one great ship in course of building which they mean to arm with 100-ton guns. This, when finished, will be the most powerful war-ship of the day, but meantime the Russians are the only people who have attempted in practice to rival our own dockyards.

Admiral Popoff invented a design on which two circular ships—named Popoffkas, after him—were constructed. These vessels are circular in form, have guns in an unroofed turret, and are slow in speed, the highest being ten or eleven knots. They are intended solely for coast and river defence, and could never come out to fight a fleet. They are liable to capture by boats dashing at and boarding them, and they are very liable to be run down and sunk by any resolute ironclad that will ram them. The *Peter the Great*, which is larger than the *Devastation*, but in other respects like her, is the only real competitor of our English seagoing, mastless ironclads. She was completed in great haste, and at great cost, with a view to her going to the Mediterranean to strengthen the Russian ships there; but after starting on her journey she was recalled to Cronstadt, and is not likely again to be sent on a voyage of any length.

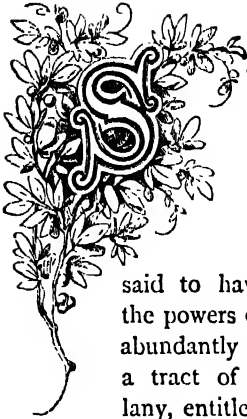
The *Téméraire* is interesting on account of the novel principle upon which her armament is worked, a characteristic which distinguishes her from any other of our ironclads. Although her length is only 280 feet, she has no less than 62 feet of beam; her armour-plating abreast of the battery is 11 inches of iron, and the ship is armour-plated round the water-line with armour of 11 inches thick amidships, which extends

5 feet below the water-line and tapers off to 4 inches round the bow and stern; a few feet below the bows a powerful spur or ram is fitted, which projects 8 feet beyond the bow. The *Téméraire* is brig rigged, and the height of her masts from the water-line is no less than 180 feet. The vessel is a magnificent specimen of engineering skill, and a most costly experiment. The spars are of the heaviest description, the main yard measuring 150 feet, and, as in the *Inflexible*, the top hamper would be disposed of overboard on going into action.

Unlike other ships, the *Téméraire* is very high between decks and well ventilated. Her engines, made by Messrs. Humphrys, Tennant and Co., are of 7,000 horse-power. The speed gained, with everything on board and the ship drawing 26 feet of water, is $14\frac{1}{2}$ knots an hour. She carries 650 tons of coal. Her armament consists of four 25-ton guns and four 18-ton guns, and she is fitted with ports for firing the Whitehead torpedoes. She also carries Harvey's torpedoes and outrigger torpedoes, and each man on board is supplied with a rifle, revolver, or cutlass.

Two of the 25-ton guns are mounted, one at each end of the ship, in barbette towers, and are worked entirely by hydraulic machinery. These guns are protected by 10 inches of iron round the tower at the side, but have no protection whatever when in the firing position. The gun when in the loading position is entirely out of sight, and rests upon clocks; the powder and projectile are raised to the muzzle from the magazine and lower deck by means of a hydraulic lift, and then rammed home by hydraulic machinery. The gun continues out of sight while being "laid," and can be raised and fired in a few seconds. Both guns revolve upon turn-tables, and the foremost gun can be fired right ahead and the after gun right astern. Only five men are required in the barbette tower for loading, elevating, and firing the gun. The recoil caused by the firing replaces the gun out of sight, and the turn-table being set in motion immediately, the gun is at once revolved into the loading position.

REMARKABLE DELUSIONS.



SCARCELY would credence be given in the present day to the accounts of the cruelties formerly practised upon those who were said to have "trafficked with the powers of darkness" unless abundantly substantiated. In a tract of Chambers' Miscellany, entitled "The Old Witchcrafts," an amazing account is given of the superstition of former times. A belief in witchcraft seems to have formed an article of religious faith in every European country throughout the sixteenth and seventeenth centuries.

In England witchcraft became the subject of express statutes of Henry VII., Elizabeth, and also of James I. This last monarch, who, we shall afterwards see, was a great witch-fancier while in Scotland, brought with him to England a keen sense of the duty of finding out and punishing all sorts of diablery. The Act passed in the first year of his reign in England defines the crime with a degree of minuteness worthy of the adept from whose pen it undoubtedly proceeded. "Any one that shall use, practise, or exercise any invocation of any evil or wicked spirit, or consult or covenant with, entertain or employ, feed or reward, any evil or wicked spirit, *to or for ANY purpose*; or take up any dead man, etc.; such offenders, duly and lawfully convicted and attainted, shall suffer death." We have here witchcraft first distinctly made, of itself, a capital crime. Many years had not passed away after the passing of this statute ere the delusion, which had heretofore committed but occasional and local mischief, became an epidemical frenzy, devastating every corner of England. Leaving out of sight single executions, we find such wholesale murders as the following in

abundance on the record: In 1612, twelve persons were condemned at once at Lancaster, and many more in 1613, when the whole kingdom rang with the fame of the "Lancashire witches;" in 1622, six at York; in 1634, seventeen in Lancashire; in 1644, sixteen at Yarmouth; in 1645, fifteen at Chelmsford; and in 1645 and 1646, sixty persons perished in Suffolk, and nearly an equal number at the same time in Huntingdon. These are but a few selected cases.

The poor creatures who usually composed these ill-fated bands are thus described by an able observer: "An old woman with a wrinkled face, a furred brow, a hairy lip, a gobbler tooth, a squint eye, a squeaking voice, or a scolding tongue, having a ragged coat on her back, a spindle in her hand, and a dog by her side—a wretched, infirm, and impotent creature, pelted and persecuted by all the neighbourhood, because the farmer's cart had stuck in the gateway, or some idle boy had pretended to spit needles and pins for the sake of a holiday from school or work"—such were the poor unfortunates selected to undergo the last tests and tortures sanctioned by the laws, and which tests were of a nature so severe that no one would have dreamed of inflicting them on the vilest of murderers. They were administered by a class of wretches who, with one Matthew Hopkins at their head, sprung up in England in the middle of the seventeenth century, and took the professional name of *witch-finders*. The practices of the monster Hopkins, who, with his assistants, moved from place to place in the regular and authorised pursuit of his trade, will give a full idea of the tests referred to, as well as of the horrible fruits of the witchcraft frenzy in general. From each town which he visited Hopkins exacted the stated fee of twenty shillings, and in consideration thereof, he cleared the locality of all suspected persons, bringing them to confession and the stake in the following

manner : He stripped them naked, shaved them, and thrust pins into their bodies, to discover the witch's mark ; he wrapped them in sheets, with the great toes and thumbs tied together, and dragged them through ponds or rivers, when, if they sunk, it was held as a sign that the baptismal element did not reject them, and they were cleared ; but if they floated, as they usually would do for a time, they were then set down as guilty, and doomed. He kept them fasting and awake, and sometimes incessantly walking, for twenty-four or forty-eight hours, as an inducement to confession, and, in short, practised on the accused such abominable cruelties that they were glad to escape from life by confession. If a witch could not shed tears at command, said the further items of this wretch's creed, or if she hesitated at a single word in repeating the Lord's Prayer, she was in league with the Evil One. The results of these and such-like tests were actually and universally admitted as evidence by the administrators of the law, who, acting upon them, condemned all such as had the amazing constancy to hold out against the tortures inflicted. Few gave the courts that trouble. Butler has described Hopkins in his *Hudibras* as one

"Fully empowered to treat about .
Finding revolted witches out.
And has he not, within this year,
Hanged *three score* of them in *one* shire ?
Some only for *not* being drowned,
And some for sitting above ground."

After he had murdered hundreds, and pursued his trade for many years (from 1644 downwards), the tide of popular opinion finally turned against Hopkins, and he was subjected, by a party of indignant experimenters, to his own favourite test of swimming. It is said that he escaped with life, but from that time forth he was never heard of again.

A belief in witchcraft, however, still continued virulent in England, and was argumentatively supported by grave and pious men. The grounds of credibility do not seem to have been earnestly investigated.

Richard Baxter, who wrote in 1651, founds his opinion of the truth of witchcraft on the fact that many persons had been tried and put to death for the crime. It did not occur to him to inquire whether the imputed crime were well or ill founded. Such was the loose reasoning that prevailed in England and elsewhere in the seventeenth century. Witchcraft was a truth, because everybody had acted upon the conviction of its being a truth ! How has the progress of society, with the reign of peace and good-will on earth, been retarded by this accommodating method of argument !

It is an undoubted fact, however to be accounted for or palliated, that during the troublous seventeenth century, prosecutions for witchcraft were prominent in some proportion to the ascendancy of the Puritanic cause. While, as during the time of the Civil War and Commonwealth, the ruling powers acted under strong religious impulses, the scriptural maxim of "Thou shalt not suffer a witch to live" had the force of a commandment. In a time of indifference, as in the reign of Charles II., rulers were disposed, so far as popular prepossessions would permit, to let these poor old creatures cheaply off. The era of the Long Parliament was that during which the witch-mania attained its growth. *Three thousand persons* are said to have perished during the continuance of the sittings of that body by legal executions, independently of summary deaths at the hands of the mob.

With the Restoration came a relaxation, but not a cessation, of this severity. One noted case occurred in 1664, when the enlightened and just Sir Matthew Hale tried and condemned two women, Amy Dunny and Rose Callender, at Bury St. Edmunds, for bewitching children, and other similar offences. Some of the items of the charge may be mentioned. Being capriciously refused some herrings, which they desired to purchase, the two old women expressed themselves in impatient language, and a child of the herring-dealer soon afterwards fell ill—in consequence ! A carter drove his wagon against the cottage of Amy

Dunny, and drew from her some not unnatural objurgations, immediately after which, the vehicle of the man stuck fast in a gate, without its wheels being impeded by either of the *posts*, and the unfortunate Amy was credited with the accident. Such accusations formed the burden of the ditty, in addition to the bewitching of the children. These young accusers were produced in court, and, on being touched by the old women, fell into fits. But on their eyes being covered, they were thrown into the same convulsions by *other* persons, precisely in the same way. In the face of this palpable proof of imposture, and despite the general absurdity of the charges, Sir Matthew Hale committed Amy Dunny and Rose Callender to the tender mercies of the hangman. It is stated that the opinion of the learned Sir Thomas Browne, who was accidentally present, had great weight against the prisoners. He declared his belief that the children were truly bewitched, and supported the possibility of such possessions by long and learned arguments, theological and metaphysical. Yet Sir Matthew Hale was one of the wisest and best men of his time, and Sir Thomas Browne had written an able work in exposition of popular fallacies!

It was during the reign of Charles II. that many persons in high station were found to express a doubt of the reality of witchcraft. The first book treating the subject rationally, and trying to disprove that the Scripture warranted either the crime or its punishment, was that of Webster, published in 1677. It is amusing to observe in this treatise the anxiety of the author to vindicate himself from the charge of irreligion, which he foresaw would be brought against him, "crossing the common stream of vulgar opinion." Chief Justices North and Holt, to their lasting credit, were the first individuals occupying the high places of the law who had at once the good sense and the courage to set their faces against the continuance of this murderous delusion. In one case, by detecting a piece of gross imposture, Chief Justice North

threw into disrepute, once for all, the trick of *pin-vomiting*, one of the most striking and convincing practices of the possessed. A male sorcerer stood at the bar, and his supposed victim was in court, vomiting pins in profusion. These pins were straight, a circumstance which made the greater impression, as those commonly ejected in such cases were bent, engendering frequently the suspicion of their having been previously and purposely placed in the mouth. The chief-justice was led to suspect something in this case by certain movements of the bewitched woman; and by closely cross-questioning one of her own witnesses, he brought it fully out, that the woman placed pins in her stomacher, and, by a dexterous dropping of her head in her simulated fits, picked up the articles for each successive ejection. The man was found not guilty. The acquittal called forth such pointed benedictions on the judge from a very old woman present, that he was induced to ask the cause. "Oh, my lord," said she, "twenty years ago they would have hanged me for a witch if they could; and now, but for your lordship, they would have murdered my innocent son."

After the time of Holt, the ministers of the law went a step farther in their course of improvement, and spared the accused in spite of condemnatory verdicts. In 1711, Chief Justice Powell presided at a trial where an old woman was pronounced guilty. The judge, who had sneered openly at the whole proceedings, asked the jury if they found the woman "guilty upon the indictment of conversing with the 'devil in the shape of a cat.'" The reply was, "We do find her guilty of that;" but the question of the judge produced its intended effect in casting ridicule on the whole charge, and the woman was pardoned. Yet, frightful to think, after all this, in 1716, Mrs. Hicks and her daughter, aged nine, were hanged at Huntingdon for selling their souls to the devil, and raising a storm by pulling off their stockings, and making a lather of soap! With this crowning atrocity the catalogue of murders in England closes. And a long

and a black catalogue it was. Barrington, in his observations on the statute of Henry VI., does not hesitate to estimate the numbers of those put to death in England on this charge at THIRTY THOUSAND!

Notwithstanding that condemnations were no longer obtainable after 1716, popular outrages on supposed witches continued to take place in England for many years afterwards. On an occasion of this kind, an aged female pauper was killed by a mob near Tring, in Staffordshire; and for the murder, one of the perpetrators was tried and executed. The occurrence of such outrages having been traced to the unrepealed statute of James I. against witchcraft, an Act was passed, in 1736, discharging all legal proceedings on the ground of sorcery or witchcraft; and since this period, prosecutions for following hidden arts have had no higher aim than the punishing of a pretended skill in fortune-telling and other forms of practical knavery.

It has been said that James I. brought with him from Scotland strong impressions

on the subject of witchcraft, and, accordingly, we now refer to the history of the delusion in that country. In the reign of Queen Mary, the contemporary of Elizabeth, the public mind in Scotland fell into the common frenzy, and an act was passed by the Scottish Parliament for the suppression and punishment of witchcraft. In virtue of this law, great numbers were tried and executed. The witch mania in Scotland was, through these prosecutions, brought to an extravagant height in the year 1591, when a large number of unhappy beings were cruelly burnt to death on the Castle-hill of Edinburgh. The Scottish witches were nearly all aged women; only a few men figured in the prosecutions. On coming to exercise the functions of majesty, James made numerous judicial investigations into alleged cases of witchcraft, and derived a pleasure in questioning old women respecting their dealings with Satan. The depositions made at these formal inquests are still preserved, and are among the most curious memorials of the sixteenth century.



THE DRAGON TREE OF TENERIFFE.

BOTANISTS tell us of the *Dracæna*, which is a plant belonging to the order *Liliaceæ*. The most remarkable species is *Dracæna draco*, the "dragon tree" of Teneriffe, which attains a great size, and, unlike the majority of monocotyledonous trees, has forked branches. This plant yields a red resin, resembling dragon's blood; but it is not known in commerce. They are unlike any other family of plants, and only a few of the old ones are now remaining in the Canary Islands. They grow to fifty or sixty feet high, and are, at three hundred years old, twenty feet round.

Each little branchlet of leaves, fruit, and

flowers, becomes a separate plant, sending its air-roots down the old trunk, on the outside of it, so that the original tree becomes a mere framework for supporting the living network outside. Humboldt estimated the great tree at Orotava, now a mere ruin, at 6,000 years old.

"This gigantic tree," says Von Humboldt, in his "Pictures of Nature," "grows in the garden of the little villa of Orotava, called Taoro, one of the most beautiful spots in the civilized world. In 1799, when we ascended the Peak of Teneriffe, we found that this enormous tree was forty-eight feet in circumference a little above the root." Sir George Staunton asserts that at the height of ten feet the tree is twelve feet in diameter. Tradition reports that this tree was an object of veneration to the Guanches,

as the Ash of Ephesus was to the ancient Greeks ; and that in 1402, when Bethencourt first visited the island, it was as large and as hollow as it is now : "When I saw

the tree it seemed to enjoy an eternal youth, and still bore flowers and fruits."

In the torrid zone a forest of *Cæsalpinia* and of *Hymenæa* is perhaps a monument a



THE DRAGON TREE OF TENERIFFE.

thousand years old ; and remembering that the dragon tree of Orotava is of very slow growth, that its appearance now differs very slightly from the same tree described 400 years ago, we may conclude that it is

extremely aged. With the Baobab, it is perhaps the most ancient inhabitant of our planet. A few years ago this venerable tree was sadly damaged in a storm.

In her charming narrative, "A Voyage in

the *Sunbeam*," Mrs. Brassey gives an account of her visit to this home of floral wonders :—

"We went ashore, and drove up to Villa Orotava. The wide road is macadamised and marked with kilometre stones, and is planted on either side with pepper trees, plane trees, and the *Eucalyptus globulus*, which has grown 35 metres, or 115 feet, in seven years. The hedges are formed of blue plumbago, scarlet geranium, yellow acacia, lavender-coloured heliotrope, white jasmine, and pink and white roses.

After driving a few miles, we turned down an old paved road towards the sea, and, by dint of a considerable amount of shaking, arrived at the celebrated Botanical Gardens, mentioned by Humboldt and others. We passed through a small house, with a fine dragon tree on either side, and entered the gardens, where we found a valuable collection of trees and shrubs of almost every known species. The kind and courteous curator, Don Hermann Wildgaret, accompanied us, and explained the peculiarities of the many interesting plants. The climate of Teneriffe is so equable that the island forms a true garden of acclimatisation for the vegetable productions of the various countries of the world.

A rough drive over paved roads, commanding extensive views of sea and rocks, and of some palm trees on a promontory in the distance, brought us at about seven o'clock to the boat, which was waiting our return. We arrived in due course on board the *Sunbeam*, laden with bouquets of the

choicest flowers, and soon after dinner we all retired to bed, not having yet recovered from the fatigues of yesterday.

What one gains in the beauty and abundance of vegetable life here, one loses in its rapid and premature decay. Fruit gathered in the morning is scarcely fit to eat at night, and the flowers brought on board yesterday evening were dead this afternoon, whilst some of the roses we brought from Cowes lasted until we reached Madeira, though, it must be owned, so many fell to pieces that my cabin used to be daily swept with rose-leaves instead of tea-leaves.

We went ashore soon after six, and drove straight to the garden of the Marquis de Sonzal, where there is a beautiful palm tree, 101 feet high, the remains of an enormous dragon tree, old even in the fifteenth century, besides hedges of myrtle, jasmine, and clematis, and flowers of every description in full bloom. The dragon tree is a species of *dracæna*, and looks rather like a gigantic candelabra, composed of a number of yuccas, perched on the top of a gnarled and somewhat deformed stem, half palm, half cactus. Another beautiful garden was next visited, belonging to the Marquis de la Candia, who received us and showed us his coffee and plantains in full growth, as well as a magnificent Spanish chestnut tree coeval with the dragon tree. Out of one of its almost decayed branches a so-called young tree was growing, but it would have been thought very respectable and middle-aged in any other locality."



THE

NATURAL BRIDGE OF VIRGINIA.



NE of the most beautiful parts of the United States is the great valley of Virginia. In that valley is a natural arch, over a stream called the Cedar Creek, which is considered by many as the second great curiosity of America, Niagara Falls being the first.

The Natural Bridge is entirely the work of God. It is of solid limestone, and connects together two huge mountains by a most beautiful arch, over which there is a great wagon road. Its length, from one mountain to the other, is nearly eighty feet; its width about thirty-five; its thickness about forty-five; and its perpendicular height above the water is not far from two hundred and twenty feet. A few bushes grow on the top, by which the traveller may hold himself as he looks over. On each side of the stream and near the bridge are rocks, projecting ten or fifteen feet over the water, and from two hundred to three hundred feet above its surface, all of limestone. The visitor cannot give so good a description of this bridge as he can of his feelings when, softly creeping out on a shaggy, projecting rock, and looking down a chasm from fifty to sixty feet wide, he sees, nearly three hundred feet below, a wide stream, foaming and dashing against the rocks beneath, as if terrified at the rocks above. There are trees under the arch whose height is perhaps seventy feet; and yet, to look down upon them, they appear like small bushes of two or three feet in height.

The view of the bridge from below is as pleasing as the top is awful. The arch from beneath would seem to be about two feet in thickness. Some idea of the distance from the top to the bottom may be formed from the fact that when one person

stands on the bridge and another beneath, neither can speak with sufficient loudness to be heard by the other. A man, from either view, does not appear to be more than four or five inches in height.

Under this arch it was customary for visitors to engrave their names. Here Washington climbed up twenty-five feet and carved his own name, where it still remains. Some, wishing to immortalise their names, have engraved them deep and large, while others have tried to climb up and insert them high in this book of fame.

Many years ago, a young man, being ambitious to place his name above all others, was very near losing his life in the attempt. After much fatigue, he climbed up as high as possible, but found that the person who had before occupied his place was taller than himself and, consequently, had placed his name above his reach; but he was not thus to be discouraged. He opened a large jack-knife, and, in the soft limestone, began to cut places for his hands and feet. With much patience and difficulty, he worked his way upwards, and succeeded in carving his name higher than the most ambitious had done before him.

He could now triumph; but his triumph was short, for he was placed in such a situation that it was impossible to descend unless he fell upon the rugged rocks beneath him! There was no house near from whence his companions could get assistance. He could not long remain in that condition; and, what was worse, his friends were too frightened to do much for his relief. They looked upon him as already dead, expecting every moment to see him dashed in pieces.

Not so with himself. He determined to ascend! Accordingly, he plied with his knife, cutting places for his hands and feet; and, with incredible labour, and by the

exertion of every muscle, he gradually neared the top. He felt that his life was at stake, and all the terrors of death rose before him. He dared not look downwards, lest he should become dizzy; and perhaps on this circumstance his life depended. His companions stood on the top of the rock, exhorting and encouraging him. His strength was almost exhausted, but a bare possibility of saving his life remained; and hope, the last friend of the distressed, had not forsaken him. His course upwards was rather oblique than perpendicular. The most critical moment had now arrived. He had ascended con-

siderably more than two hundred feet, and had still farther to rise, when he felt himself fast growing weak. He now made a last despairing effort, and succeeded. He had cut his way not far from two hundred and fifty feet from the water, in a course almost perpendicular; and in two hours his comrades were able to throw over a rope and draw him up. They received him with shouts of joy, but he himself was completely exhausted. He immediately fainted away on reaching the top, and it was some time before he recovered. His name is still on the rocks—a memorial of folly.

PRINTING RAILWAY TICKETS.



Now that our railway system is so vastly extended, the issue of millions upon millions of tickets yearly is a necessity. Within living memory the lines were worked without tickets. In the infancy of steam-traffic, passengers paid their fares to the clerk, and walked upon the station platform with their friends until the train arrived, were then conveyed to their destinations, and left the railway without giving any proof to the officials of the station where they disembarked that they had paid their fare at the point of departure.

The originator of the idea of printing railway tickets was a man who was employed at a little wayside station in the neighbourhood of Carlisle, and those he then used were about the same size as the tickets now issued. But his arrangements for printing them were of the most primitive description. In fact, a few types fastened together in a case about the size of a nail-brush formed his sole apparatus. The name of the station to which the passenger

was going was *written* upon the ticket at the time of issue. The use of tickets on this principle gradually increased, until at last its inventor found that it would be desirable to devote himself entirely to the development of the new industry. From that day to this the printing of railway tickets has remained in the hands of the same family, who have pursued it with an amount of perseverance and ingenuity perfectly marvellous. The railways of nearly the whole world are supplied with tickets from this one manufactory. There may be seen in course of manufacture tickets for English railways, Swedish, South American, Egyptian, etc.—even Cairo tickets—a special class—for “pilgrims going to Mecca;” and others, for a fourth class, are printed for a South American line, for “slaves without shoes and stockings.”

The first great improvement made in the tickets was in numbering them. Every railway passenger has noticed that each ticket is numbered, and the date is printed by the little press in front of the ticket-clerk when he thrusts the ticket in before it is issued. A large proportion of the accuracy of the accounts of railways depends upon these numbers.

Let us see how this ticket-printing is done. First of all, here are boxes filled with coloured pieces of cardboard, which will soon be printed and made into tickets. The little steam-wrought machine for printing the tickets is an exceedingly ingenious piece of mechanism. Imagine a little table with a long, thin box rising above it at the back, and another box falling below it at the front. The table contains the printing-rollers and type-case; the boxes (the interior horizontal section of which is the size of a ticket) are for holding tickets. The upper box is filled with a pile of pieces of cardboard. One at a time, the lowest card is jerked by a spring under the printing-machinery, and falls into the lower box; in less than a quarter of a second it is printed and numbered and safely stored in the other box. All that the man has to do is to keep the upper box filled with cards, remove the lower box when filled, supply fresh empty boxes, place the printed tickets in rows, and see that the ink reservoir is full. The machine does the rest, including the printing, the inking of the type, and the moving and storing of the tickets.

The numbering is done by means of four wheels, with their centres in a horizontal line, thus forming a cylinder. These wheels have raised numerals on their edges, which imprint themselves on the tickets. The wheel which bears the numeral in the units' place moves so that a fresh type is ready for each successive ticket; that in the tens' place, at one-tenth that rate, and so on.

The next step, of counting the tickets, is a curious one. Though the greatest care

is taken to insure accuracy, mistakes *will* occur in printing the numbers on the tickets. Sometimes a number is omitted; sometimes two tickets are printed with the same number. To provide against such casualties, the tickets when printed are counted; and, as it is impossible for human eye and memory and judgment to be infallible, they are counted by machinery. This machinery again consists of a table with the two boxes as before. This time the table is simply a table with a hole in it, large enough to allow the number of a ticket to be seen through. At the side of the table is a cylinder wheel similar to that above described. The number on the cylinder is adjusted to be the same as that printed on the first ticket to be counted. The tickets are in consecutive order. As the boy turns a handle, they are jerked from the upper box to the lower, showing their numbers under the hole. The cylinder wheel revolves at the same rate, and therefore the number on each ticket and that on the wheel ought to agree. If they do not agree, then it is evident that a number has been omitted or perhaps duplicated. The deficient ticket being supplied, or the surplus one removed, the tickets are then pressed together by machinery, tied, packed, and sent to their destinations.

Such is one of the most interesting industries of our time—an industry invented, developed, and still in the hands of one family; yet spread in its interests over the whole world. And it is curious to know that in one long, low building in a suburban street of a provincial town, the tickets for the whole world, except North America, are made.

GLOBE-LIGHTNING.

SOME time since, a narrative appeared under the heading "Killed by a Meteor," in which the death of a seaman on board the schooner *Urania* was ascribed

to the fall of "a meteor resembling a ball of fire." A seaman, named Sales, was steering, and at 12.30 a.m. a meteor, like a ball of fire, fell immediately over the vessel's

stern, and exploded with a loud report resembling that of a heavy piece of ordnance. Sparks of fire were scattered all about the deck, and the steersman was killed by the shock. The fire-ball apparently travelled with the wind, which was from the south-west, and when it burst the flash was so intensely brilliant that the steward, who was lying in his berth below, declared that he saw the bright light through the seams of the deck.

In reality, however, the meteor which caused the poor fellow's death was not in any way connected with the class of objects to which shooting stars, aerolites, bolides, and fire-balls belong. In fact, the word "meteor," though etymologically applicable to the object seen by the crew of the *Urania*, has become so thoroughly identified with shooting-stars and aerolites, that it can hardly be properly made use of in describing the phenomenon. Sales met his death from lightning—but the lightning belonged to neither of the forms (forked and sheet) with which we are most familiar, but to the form denominated by Arago "globe-lightning." He had been led to notice, as a distinct class, lightnings or thunderbolts of a globular form, also remarkable for the slowness of their movements. At that time he could cite but a small number of well-authenticated facts, but a few years later, when attention had been drawn to the subject and inquiries prosecuted, "he was embarrassed," he says, "by the difficulty of selection amongst the numerous accounts which he had received."

Lightnings of the globular kind are often visible for several seconds; they move in a strange undulating manner, often appearing to avoid objects with which their course would, if unchanged, have brought them into contact; and at other times seeming to leave their course through the attraction of objects lying near it. They have even been known to rebound (in appearance) from the

earth, to separate into several small globes, and to exhibit other singular phenomena. Several instances of the effects of globe-lightning resemble very closely those which are ascribed to the object which exploded near the *Urania*. In one case three men in the cross-trees of an American ship were knocked down, and two of them killed, by what is described as "a ball of fire, which struck on the topmast." The lightning-rod had been taken down a few days before for some repairs. Arago records that the East India Company's ship the *Good Hope* was struck by lightning of a globular form, which produced a most violent detonation, killed a sailor instantaneously, and seriously wounded another. Many similar instances might be cited.

No satisfactory explanation of the singular phenomenon of globe-lightning has yet been offered, though probably the account of the matter given by Sir John Herschel in his "Treatise on Meteorology" is very near the truth. He assimilates the phenomenon to certain appearances which attend the discharge of electricity under particular circumstances artificially brought about. It must not, however, be supposed that any doubt whatever rests on the strictly electrical nature of such events as the one by which the seaman Sales suddenly met his death. Everything in the appearance, as well as in the movements, of globe-lightnings, distinguishes them clearly from aerolites and shooting-stars. And besides, it is well known that luminous electrical globes are a common attendant on volcanic eruptions. Sir William Hamilton relates that he and others repeatedly saw such globes during the eruption of Vesuvius. They issued from the thick cloud of ashes which overhung the volcano, and many of them were of considerable magnitude. They burst in the air like fireworks which are filled with what are called "serpents." Similar appearances have been observed during other eruptions.

CLEOPATRA'S NEEDLE.



FEW of the ornaments of London are more conspicuous or attractive than Cleopatra's Needle, an obelisk hewn from a single block of rose-coloured granite, and covered with hieroglyphic inscriptions. It was originally one of six which adorned the approach to the Temple of the Sun, at On, in ancient Egypt. These obelisks were erected in pairs, but only one of them now remains on its original site to attest the former splendours of the place. Of the others, two, called Pharaoh's Needles, were transferred: one to Constantinople, and the other to Rome; and two, at an earlier period, to Alexandria, where they became associated with the name of Cleopatra.

Cleopatra is celebrated in history as the daughter of Ptolemy Auletes, King of Egypt, who died in the year B.C. 51. By her father's will, she and her elder brother were to reign jointly, but, soon disagreeing, she fled for refuge into Syria. Some time after, when Julius Cæsar came into Egypt in pursuit of Pompey, she contrived, by her rare accomplishments and fascinating manners, to secure his favour, and was restored to her position. The discreditable means by which she afterwards gained sole possession of the throne; her connection with Marc Antony, and her voluntary death by the bite of a poisonous asp brought to her in a basket of flowers, and applied by herself to her arm, to prevent her being carried to Rome to grace the triumph of Augustus, are matters of history which need not be dwelt on here. It is more to the purpose to remark that, in the reign of Augustus, about twenty-three years before the birth of our Saviour, these two obelisks were removed from On to Alexandria to grace the entrance to the Cæsarium, a temple built in honour

of the Cæsars; and that, probably, from their removal for this, or for some kindred purpose, having been designed by Cleopatra, the name by which they were afterwards known was given to them: they were called "Cleopatra's Needles."

The subsequent history of the one now on the Thames Embankment may be given in very few words.

The Cæsarium, in connection with which it was erected, must have been a building of great magnificence, and situated on the shore of a beautiful bay. Marble steps, near the water, still remain to tell of its original grandeur. But it has long since passed away. The sea seems gradually to have encroached on the site on which it stood, and, probably, from the obelisk being thus undermined, it fell prostrate some centuries ago, and was gradually covered over with sand and rubbish. The remaining obelisk still stands in its original position.

In the year 1798, Egypt was invaded and conquered by the French under Napoleon Bonaparte, who took possession of the obelisk, together with many other interesting antiquities.

Conquered in their turn, in 1801, by the English forces under Sir Ralph Abercromby, they were compelled to relinquish their ill-gotten treasures, and a subscription was raised for the purpose of conveying the obelisk to England, every man in the army and navy contributing several days' pay to secure it.

The military authorities, however, objected to this proceeding, and the work was abandoned.

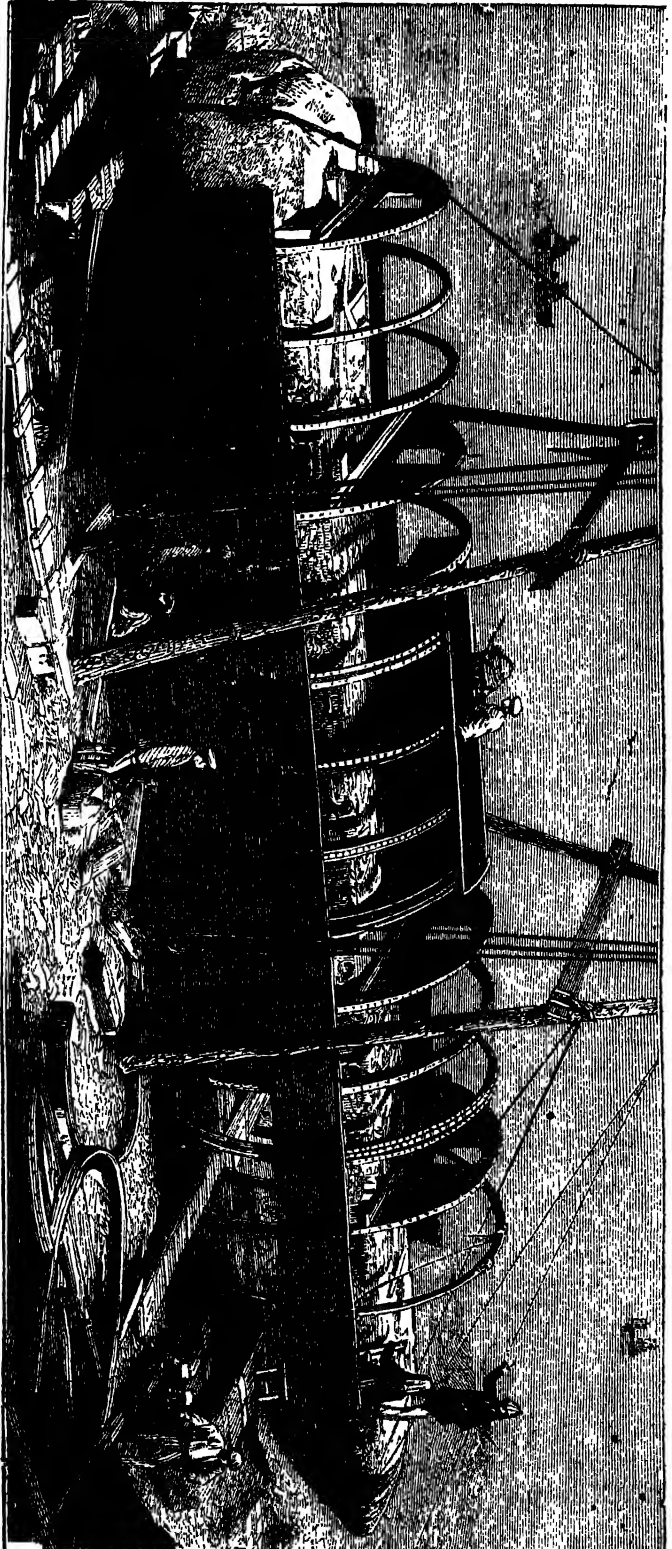
In 1820, Mehemet Ali, then the ruler of Egypt, offered it to the British nation as a token of friendship; but the estimated cost was so great as to prevent any serious attempt being made to remove it, and it was suffered to remain buried in the sand. In 1877, at

the request of Her Majesty's Ministers, the offer was renewed by Ismael Pasha, the Khedive, and accepted.

We are, however, indebted for the possession of the obelisk to the zeal and liberality of two of Her Majesty's subjects, Mr. John Dixon, C.E., and Professor Erasmus Wilson. Mr. Dixon tells us that, for some years, he had been determined, sooner or later, to have the Needle brought to England, and that his friend Professor Wilson having offered to contribute £10,000 towards its removal and erection in London, he gladly took upon himself "the risk and responsibility of getting it there, and of contributing any further sum which might be required." Mr. Dixon's effort has been crowned, so far, with most signal success.

The vessel intended to convey the Needle to this country, after having been prepared by the Thames Iron Company, was sent out in parts to Alexandria. It formed a wrought-iron cylindrical pontoon, 92 feet long by 15 feet in diameter, one of the ends being fitted with a rudder, while the other tapered into the vessel's bow. It was divided by bulkheads into eight water-tight compartments. Through these bulkheads the Needle

BUILDING THE CLEOPATRA.



was to pass, resting on wooden beams connected with them, possessing some degree of elasticity.

Such was the *Cleopatra* as originally prepared. After being taken in pieces to Alexandria, it may be said to have been built up underneath and around the Needle, as it lay embedded in the sand. The soil to some little distance was dug away, and the segment meant to cover that part was fitted around it. Thus segment after segment was added, till the whole was completed and firmly riveted together. Our engraving will give an excellent idea of the construction of the vessel.

The Needle was fixed four inches below the centre. The fore and aft compartments were filled to above the centre line with concrete, perfectly solidified, so as to render it impossible for the vessel to capsize. A roadway was then dug to the sea, and the vessel, with its solid freight, rolled into the water. Having thus been safely floated, it was fitted with a deck-house, a mast, and other needful conveniences, and made ready for the voyage.

The whole get-up of this strange craft was most ingenious. Every contrivance that could tend to insure its safety was adopted; and its buoyancy and sailing qualities were shown to be of a high order by one of the severest tests to which a vessel, likely to encounter ocean storms, can be exposed. The weight of the Needle is 180 tons; the burden of the *Cleopatra* was about 700.

All being ready, the services of a crew of eight Maltèse sailors, under Captain Carter, were secured, and the *Olga* steamer, commanded by Captain Booth, and bound for Falmouth, was engaged to take her in tow. The voyage began prosperously on the morning of September 21st, the speed of the two vessels being at the rate of about seven knots an hour. All went well till the evening of Sunday, October 14th, when the barometer fell rapidly, and a storm came on, which speedily increased to a terrific gale. The crew of the *Cleopatra*, after bravely battling for some hours with the

tempest, considered themselves in great danger. Their vessel, struck by a heavy sea, was thrown on her beam ends, and a quantity of iron rails, taken on board for ballast, breaking loose, and repeatedly doing so after being repeatedly secured by the sailors, rendered futile all attempts to right her. In answer to their signals for assistance, the *Olga*, about 9.20 p.m., sent a boat with a volunteer crew, which made its way to the *Cleopatra*; but the sailors failing to secure the ropes which the *Cleopatra* flung to them, their boat drifted rapidly away out of sight.

As the night wore on the *Cleopatra* remained helpless; but as she had now ceased to signal, the *Olga* concluded that the aid sent had reached her, and that, with the help of the six volunteers, all was going on satisfactorily. This, however, was far from being the case; the position of the *Cleopatra* was most forlorn: being mastless, heeled over till the deck made an angle of fifty degrees, and completely washed by every sea. At one o'clock on the following morning, the *Cleopatra* signalled, "We are foundering; send a boat and take us on board." In answer to this message, as soon as dawn made it possible for the *Olga* to distinguish her consort, a manilla-hemp rope (which, being light, floated on the surface of the water) was paid out. The *Olga* then steamed across her bows, causing the rope which she dragged through the water to strike on the prow of the *Cleopatra*. Before it could be caught the sea had washed it away again, and the *Olga* was obliged to come into dangerous proximity to the *Cleopatra*, in order that a line might be thrown on board the latter.

A hawser was then bent on to the line, which, after great exertion, was made fast to the *Cleopatra*, and when the signal was given, a boat was lowered from the *Olga*, and drawn across the intervening space by the line. Another line, attached to the prow of the little boat, kept it in communication with the *Olga*.

As the state of the waves permitted, the men dropped one by one into the boat,

and at length stood in safety on the deck of the steamer. Captain Booth now ordered the *Cleopatra* to be cut adrift, and at once steamed away in search of the missing men. She failed to recover any trace of them, and, on returning to her former position, could see nothing of the *Cleopatra*. Concluding, therefore, that her six brave seamen had perished, and also that the *Cleopatra* had gone down, she directed her course to Falmouth, where she arrived safely on the following Wednesday evening.

The doleful tidings soon spread through the country, exciting the sympathy and compassion of multitudes for the brave seamen, as well as a feeling of regret for the supposed loss of the Needle. Mr. Dixon, however, confident of the seaworthiness of the *Cleopatra*, declined to believe she had foundered, and expressed his "firm belief" that "she was still afloat."

The result justified his confidence. After tossing about in the Bay of Biscay for some sixty hours, at the mercy of the winds and waves, she was picked up by the English steamer *Fitzmaurice*, not far from where she had been left by the *Olga*, and towed into Ferrol Bay, from whence she was taken into the Thames, where she lay for some months while preparations were being made for the erection of the Needle.

A few words must now be added regarding the Needle. It was hewn originally, along with its former companions, in the famous quarries of Syené, on the southern border of Egypt. Its height is very nearly sixty-eight feet and a half; its width at the base from seven feet five inches, to about seven feet ten inches. It gradually tapers, as it ascends, to a width of between four and five feet, and then terminates in a summit called the pyramidion, from its being shaped like a small pyramid. This portion is seven feet six inches in height. The obelisk was doubtless chiselled into shape and polished before being taken from the quarry, and those portions of the hieroglyphic writing added which fill the middle columns on each of the four sides,

beginning on the lower half of the pyramidion, and passing downward. The hieroglyphics are carefully cut, generally to the depth of about two inches, and still bear evidence of having been very highly polished, though now some of them are much worn, and even partially destroyed. Each of the four sides has on it three columns of these inscriptions, but the monarch who erected the British obelisk used only the middle columns, leaving the others blank. These middle columns tell us of Thothmes III., by whom the obelisk was erected, while the side columns speak of Rameses II., whom some suppose to have reigned about two hundred years later.

The obelisk, when ready for removal from the quarry, was conveyed to the Nile in a way not very unlike that by which it was recently rolled into the sea, and having been floated down the river to On, was erected by Thothmes III. Its subsequent history we have narrated.

The following is a specimen of the inscription on the obelisk :—

"The Horus, the powerful bull, beloved of the Sun, the king of the South and North, Men-kheper-ra, his father Tum has set his name up to him in the palace attached to Heliopolis, giving him the seat of Seb, the dignity of Khepera, the son of the Sun Thothmes, true ruler, beloved of the Bennu of An ever living."

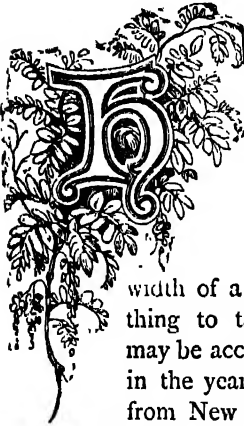
It will be pleasant to think, when visiting the British obelisk, that, without doubt, some of the heroes of Scripture antiquity were familiar with it. On, celebrated for its temple dedicated to the Sun, was not very far distant from Palestine. If not actually in the land of Goshen, where the sons of Jacob were settled under Joseph, it must have been on its borders. The traveller, journeying into Egypt from Palestine, unless he took a northerly route, could hardly fail to come to On on his way. Abraham may have seen this temple when he "went down into Egypt, and sojourned there." Joseph, who married "the daughter of Potipherah, priest of On," probably saw

the erection of this very obelisk. * Moses, who was learned in all the wisdom of the Egyptians, doubtless, by command of Pharaoh's daughter, received his early training in this very temple. He may often have walked under the shade of its obelisks, when the seeds of those mighty thoughts, afterwards to produce such wondrous fruits, were germinating in his mind. Jeremiah,

who, at a later period, was carried a captive into Egypt, and who lifted his prophetic voice against the Temple of the Sun (Jer. xliii. 13), had also, in all probability, been a visitor there. It is well known that, by its magnificence, and its repute as a seat of learning, visitors were drawn to it, in those times, from the most advanced nations of the world. . . .

A RAILWAY THREE THOUSAND MILES LONG.

NEW YORK TO SAN FRANCISCO.



HOWEVER full these days are of scientific marvels, a railway trip lasting a week, over a line 3,287 miles long, across the entire width of a continent, is something to talk of. Yet such may be accomplished any week in the year by taking a ticket from New York to San Francisco. A writer in a popular magazine describes his experiences:—

"The insignificant run of a thousand miles through Pennsylvania, Ohio, and Indiana, by the southern limits of Lake Michigan, I shall pass over. It is to our westward flight what the journey from Euston to Rugby is to the tourist bound for the Highlands. The real journey due west begins at Chicago.

The Father of Waters, the rolling Mississippi, interposes in our path at Burlington; but in America neither river nor mountain affrights the iron horse. At this point we are sixteen hundred miles from the mouth of the river, which we cross by a long and well-constructed bridge. Omaha is the next stage, so to speak, of our journey; and from that station communication with California is continued by a single line, the Union

Pacific, or, as the Americans love to call it, the Trans-Continental Railroad, with continuing lines belonging respectively to the Central Pacific Company from Promontory to Sacramento, and to the Western Pacific Company from there to San Francisco. The broad plate-glass windows of the cars give many pleasant pictures of life and natural beauty in Iowa and Illinois; and it is easy to see that here is a country which drops fatness on every side. The idea of space, illimitable space, never leaves you, for everything is on a Brobdingnagian scale, man alone appearing in the normal stature of his race.

The Missouri is crossed at Omaha by a bridge over a mile long, and the yellow, turbid flood rolls beneath us with something of anger. Omaha is of course termed a city. A store, a drinking saloon, and a few sheds and houses, often constitute a city here, just as a twisted moustache and French cap make a man a general or a colonel. But Omaha is now a thriving town, growing rapidly every day, and full of importance in its sentinel post on the western bank of the river. There is a gentleman still living in Omaha who received the first appointment of postmaster; the chief difficulty he had to contend with was the non-existence of a post-office. The letters, however, were not numerous to out-of-the-

way Omaha, and the worthy official was wont to clap the mails into the crown of his hat, and keep them there until by chance he met the person whose letter thus reposed upon his honoured head. Omaha is now a kind of postal centre, has a grand post-office, and half a dozen clerks.

For awhile the road, after leaving Omaha, runs parallel with the river Platte, a tributary of the Missouri, and almost as great a stream. The valley enriched by its waters teems with fertilisation, and the boundless plains stretch away to the very verge of the northern horizon. Mechanical agencies become rarer and scarcer as we proceed westward; habitations are sparse and humble; we begin to think and talk of buffalo and antelope, although as a matter of fact there is but one line (the Kansas and Pacific) from which railway passengers by any chance catch a passing glimpse of the former beast. The plains have not sufficient wood and water to tempt settlers in any numbers, but even on these wastes, once the dread of emigrants travelling in company for the sake of protection, homesteads smile beneath you. In this great agricultural State of Nebraska the plains, if wide and bare, are marvellously rich, and there are grass-lands in our track said, and no doubt with truth, to be unsurpassed.

As you approach Cheyenne the Rocky Mountains lift up their crowns, and the land becomes wild with the wildness of rugged barrenness. The atmosphere is highly exhilarating; by the time we have ascended to Cheyenne, we are over six thousand feet above the level of the ocean, and the Rocky Mountains invite to a still higher elevation. Like Omaha, Cheyenne is brand new and thriving. Not far to the south—as in this country we count distance—is Denver, and the outlying riches of Colorado; and Cheyenne is the ante-chamber to that land of lawlessness and gold. Onwards, still Westward Ho! we pursue our journey. Granitic masses, rude bluffs, sage-brush, alkali plains, and distant peaks, tell a tale of human perseverance and engineering skill. Snow-sheds and snow-fences appear

suggestive of the severe winter storms and the snow-plough with which the locomotive cuts its way through the whitened track. There are miles upon miles of snow-fences; and on the plains, and on the mountain-sides, there stand snow-ploughs, eleven feet high, ready for the six or eight locomotives which, in a few months, will be urging them forward through the accumulated snow. The snow-sheds are solidly constructed with plank and stone, as they must needs be, since their presence indicates a point of danger. Upon this section of the line you eat at stations placed at proper distances apart; and the food, though dear, is of excellent quality. Buffalo, elk, grouse, prairie fowl, antelope, turkey, and other 'small deer,' are offered to you in great variety.

Cañons and gorges are now frequent, and the rugged scenery puts on increasing grandeur as the train proceeds onwards and upwards. Sherman stands on the summit of the Rocky Mountains, eight thousand two hundred feet above the level of the sea, and we have now, in round reckoning, completed two-thirds of our trip, and are assured that the last third is infinitely more interesting than anything previously experienced. Such shrubs and trees as have now the hardihood to burst into existence in these high latitudes are dwarfed and shrivelled, but there is game galore in the district, and the brooks and water-courses, galloping down to the plains, abound with trout. Heavy brakes—and the brake principle is applied to perfection upon these lines—are required as the train speeds down the western slope of the mighty mountain range, and in good time a halt is called at Lamarie, which may be designated the Crewe of the system. The veritable prairies come next, home of countless herds of deer, and haunt, in the depth of winter, of the ponderous elk. Still imposingly rugged is the landscape, and most imposing of all the Wasatch Mountains, which form the wall of partition between the Rocky Range and Salt Lake City. The Wasatch Cañons are sublime, the mountains overlooking Salt Lake Valley surpassingly lovely.

At Ogden, the station for Salt Lake City, the running is taken up by the Central Pacific Railway Company, and strong must be the temptation to a European compelled to pass the junction without the opportunity of turning aside to leave his card at the late Brigham Young's chief habitation. A tall, thin, silent man, with a small party of emigrants, amongst whom women predominated in the ratio of five to one, left the main line here, and walked away, mysterious as they had been throughout the journey from Chicago, in the direction of the Salt Lake branch. Two grisly men met them on the platform, a deputation of elders perhaps from the City of Saints, only thirty-nine miles distant.

The waters of Salt Lake now come within our ken, distance lending enchantment to the view, and shadowy mountain summits dotting the horizon beyond. And soon we enter what with too much grandiloquence has been termed, and is still known as, 'The Great American Desert,' sixty square miles of alkali plain speckled with the stunted sage-brush. Agriculturists maintain that this apparent waste, dreary to the eye, and useless to mankind, is unmistakably fertile. The Humboldt Valley, of which we see a fair sample *en passant*, is famous grazing land, and amongst the huge, fierce-horned cattle you may pick out the sturdy Hereford and aristocratic Devon, to remind you of home. This strip of living green runs eighty miles, with an average width of ten miles. Soon we are in the regions where miners toil and sojourn. That line of small black objects winding down yonder hillside is a column of mules and mustangs, laden with stuff that represents the needs and fruits of a miner's life. Since leaving Omaha an occasional Indian, a dismal redskin, half-heathen, half-Christian, has looked stolidly at us as we passed; but the most sentimental of our company would have been puzzled to discover in him any remnants of the noble savage who, in the fascinating stories of boyhood, ruled the wigwam and made glorious the war-path. Farther down, in the midst of the

vapour which enclouds Hot Spring Valley, a spur of little hills athwart the broad hollow divides the districts preyed upon respectively by the Shoshones and Pintes.

The Sierras are now before us, with leagues of massive snow-sheds protecting the railroad from the avalanches and snow-drifts which the lofty peaks, deep caverns, and terrible precipices, hurl into the cuttings the genius of man has made and maintained through the last wild barrier. We hasten through a succession of surprises into the Summit Tunnel, and are not astonished to learn that the conductors of the railway have every year to protect their passengers and rolling stock from five-and-forty miles of severe snow-line.

Then comes a glimpse of California below us, and the morning of the seventh day heralding in a rush down the Sierra from Summit to Colfax, that shall make the blood tingle and the pulses fly again—a rush from a seven thousand to a two thousand five hundred feet elevation, in two hours and a half. The wind makes weird music as you whirl round curves and cliffs, looking down into awesome chasms and upon dense woodland steeps. At the end of the train there is an open car, where, if you are so favoured, this glorious panorama may be surveyed without let or hindrance.

The operations of the gold-miners attract your attention on the lower ground, and the long flumes through which the water is conducted up and down hill, to serve the hardy miners, will for awhile keep the track close company. It is a new land, after the deserts a welcome Goshen, into which you have now entered. Airy piazzas surround the farmhouses, brilliant flowers spangle the fields and banks; the snow-sheds and sierras seem the remembrance of a dream in this atmosphere of summer. See the gardens and shrubberies and orchards, out of which rises the splendid dome of the Capitol of Sacramento City, and you shall be pardoned for whispering to your neighbour that if you were not wedded to the 'free fair homes of England,' you would be content to dwell in peerless California."



AN AMERICAN HURRICANE.

As is well known, the continent of America is occasionally visited by violent storms of wind, which have been known to traverse nearly the whole extent of the United States and to leave such deep impressions in their wake as are not easily to be forgotten. The following is a graphic account of one of these fearful phenomena :—

“I had left the village of Shawney, situated on the banks of the Ohio, on my return from Henderson, which is also situated on the banks of the same beautiful stream. The weather was pleasant and, I thought, not warmer than usual at that season. My horse was jogging quietly along; and my thoughts were, for once in my life at least, entirely engaged in commercial speculations. I had forded Highland Creek, and was on the eve of entering a tract of bottom land or valley that lay between it and Canoe Creek, when on a sudden I remarked a great difference in the aspect of the heavens. A hazy thickness had overspread the country, and I for some time expected an earthquake; but my horse exhibited no propensity to stop and prepare for such an occurrence. I had nearly arrived at the verge of the valley, when I thought fit to stop near a brook, and dismounted to quench the thirst which had come upon me.

I was leaning on my knees, with my lips about to touch the water, when, from my proximity to the earth, I heard a distant murmuring sound of an extraordinary nature. I drank, however, and, as I rose on my feet, looked towards the south-west, where I observed a yellowish oval spot, the appearance of which was quite new to me. Little time was left me for consideration, as the

next moment a smart breeze began to agitate the taller trees. It increased to an unexpected height, and already the smaller branches and twigs were seen falling in a slanting direction towards the ground. Two minutes had scarcely elapsed, when the whole forest before me was in motion. Here and there were one tree pressed against another, a creaking noise being produced similar to that occasioned by the violent gusts which sometimes sweep over the country. Turning instinctively toward the direction from which the wind blew, I saw, to my great astonishment, the noblest trees of the forest bend their lofty heads for a while; and, unable to stand against the blast, were falling into pieces. First the branches were broken off with a crackling noise, then went the upper parts of the massy trunks, and in many places whole trees of gigantic size were falling entire to the ground. So rapid was the progress of the storm that before I could think of taking measures to insure my safety the hurricane was passing opposite the place where I stood. Never can I forget the scene which at that moment presented itself. The tops of the trees were seen moving in the strangest manner, in the central current of the tempest, which carried along with it a mingled mass of twigs and foliage that completely obscured the view. Some of the largest trees were seen writhing under the gale; others suddenly snapped across; and many, after a momentary resistance, fell uprooted to the earth. The mass of branches, twigs, foliage, and dust, that moved through the air was whirling onward like a cloud of feathers, and on passing disclosed a wide space filled with broken trees, naked stumps, and heaps of shapeless ruins, which marked the path of the tempest. This space was about the space of one-fourth of

a mile in breadth, and to my imagination resembled the dried-up bed of the Mississippi, with its thousands of planters and shavings strewed in the sand and in various degrees. The horrible noise resembled that of the great cataracts of the Niagara, and, as it howled along in the track of the desolating tempest, produced a feeling in my mind which it were impossible to describe.

The sky had now a greenish, lurid hue; and an extremely disagreeable, sulphurous odour was diffused in the atmosphere. I waited in amazement, having sustained no material injury, until nature at length resumed her wonted aspect. For some moments I felt undecided whether I should return to Morgan Town or attempt to force my way through the wrecks of the tempest. My business, however, being of an urgent nature, I ventured into the path of the storm, and, after encountering innumerable difficulties, succeeded in crossing it. I was obliged to lead my horse by the bridle to enable him to leap over the fallen trees; while I scrambled over or under them in the best way I could, at times so hemmed in by the broken tops and tangled branches as almost to become desperate. On arriving at my house I gave an account of what I had seen, when, to my surprise, I was told there had been very little wind in the neighbourhood, although in the streets and gardens many branches and twigs had

fallen in a manner which had excited great surprise.

Many wondrous accounts of the devastating effects of this hurricane were circulated in the country after its occurrence. Some log houses, we were told, had been destroyed, and their inmates killed. One person informed me that a wire sifter had been conveyed by the gust to a distance of many miles. Another had found a cow lodged in the fork of a half-broken tree. But, as I am disposed to relate only what I have myself seen, I shall not lead you into the region of romance, but shall content myself with saying that much damage was done by this awful visitation. The valley is yet a desolate place, overgrown with briars and bushes thickly entangled amidst the tops and trunks of fallen trees, and is the resort of ravenous animals, to which they betake themselves when pursued by man or after they have committed their depredations on the farms of the surrounding districts. I have crossed the path of the storm at a distance of 100 miles from the spot where I witnessed its fury, and again 400 miles farther in the State of Ohio. Lastly, I observed traces of its ravages on the summits of the mountains connected with the great pine forest of Pennsylvania, 300 miles beyond the place last mentioned. In all these different parts it appeared to me not to have exceeded a quarter of a mile in breadth."

FISHING FOR SPONGE.

SPONGES, to speak of them in a general way, are zoophytes, half-animal, half-vegetable. They grow on rocks in the sea, and fishing for them is a regular trade on the coast of Greece, Syria, the West Indies, and elsewhere. In some instances they are secured by diving, and in others by being pulled up by a

pronged instrument. The total value of the sponges fished on the coast of Syria is from twenty to twenty-five thousand pounds per annum. The production is, however, falling off through excessive fishing, and the consequent exhaustion of the fishery-grounds. About two hundred and fifty to three hundred boats are employed in this industry on the coast of Syria, manned by

about fifteen hundred men. The centres of production are Tripoli, Ruad, Lattakia, and Batroun on the coast of Mount Lebanon. The best qualities are found in the neighbourhood of Tripoli and Batroun; but the boats visit all parts of the coast, from Mount Carmel in the south, to Alexandretta in the north.

The majority of the boats used are ordinary fishing-boats, three parts decked over, and carrying one mast with an ordinary lug-sail. They are from eighteen to thirty feet in length, and are manned by a crew of four or five men, one of whom is specially engaged for the purpose of hauling, while the rest are divers. In some cases, the men own their own boats, but generally they are hired for the season, which extends from June to the middle of October. No wages are paid; the remuneration consists in an equal share of the produce of the fishing. The profits of a good diver reach as high as forty pounds a season. Diving is practised from a very early age up to forty years, beyond which few are able to continue the pursuit. It does not appear, however, that the practice has any tendency to shorten life, although, as the diver approaches forty, he is less able to compete with his younger and more vigorous brother. The time during which a Syrian diver can remain under water depends, of course, on his age and training. Sixty seconds is reckoned good work, but there are rare instances of men who are able to stay below eighty seconds. The men on the coast, however, make extraordinary statements as to the length of time their best hands are able to remain under water, and gravely assert that eight and ten minutes are not impossibilities.

The manner of diving is as follows:

The diver—naked, of course,—with an open net around his waist for the receptacle of his prizes, seizes with both hands an oblong white stone, to which is attached a rope, and plunges overboard. On arriving at the bottom, the stone is deposited at his feet, and keeping hold of the rope with one hand, the diver grasps and tears off the sponges within reach, which he deposits in his net. He then, by a series of jerks to the rope, gives the signal to those above, and is drawn up.

In former years, the Syrian coast was much frequented by Greek divers from the islands of the Archipelago. Their number is now restricted to five or six boats annually, the skill of the Syrian, combined with his superior knowledge of the fishing-grounds, enabling him to compete successfully with his foreign opponent. Although they vary much in quality and size, sponges may be generally classified as—the fine white bell-shaped sponge, known as the “toilet sponge;” the large reddish variety, known as “sponge de Venise,” or “bath-sponges;” and the coarse red sponge used for household purposes and cleaning. Two-thirds of the produce of the Syrian coast are purchased by the native merchants, who send it to Europe for sale; while the remainder is purchased on the spot by French agents, who annually visit Syria for the purpose. France takes the bulk of the finest qualities, while the reddish and common sponges are sent to Germany and England. The revenue derived by the Government from this industry is a tenth of the value of the produce. The annual import of sponges from all countries into the United Kingdom amounts in value to about one hundred and twenty-five thousand pounds.

ANIMAL LIFE IN SOUTH AFRICA.

NATURALISTS say that Africa can enumerate five times as many species of quadrupeds as Asia, and three times as many as America. The most colossal of land animals are the denizens of her recesses. Her upland pastures and dense forests are the haunts of the most

gigantic quadrupeds. There are birds of every variety and of the most glorious plumage, including the crown-bird, the most beautiful of the feathered tribes; the tiny sugar-bird, the *nectarina* of naturalists; and the wonderful honey-bird. The mountains and rocks are the haunts of the lion and pan-



ther—the rivers the abode of the crocodile, the hippopotamus, and the rhinoceros. Her inland streams are alive with crabs and tortoises; her pools vocal with the hoarse notes of enormous frogs; whilst in the solitude of her parched deserts the serpent-eater and the ostrich find a congenial home. Even in the most deathlike and desolate tracts the earth teems with animated beings, rejoicing in the life God has given them. There, thousands of lizards

and land-tortoises are found basking under the torrid rays of a tropical sun; whilst the termites, in numbers inconceivable, are engaged, with wondrous skill and artifice, in erecting their conical habitations.

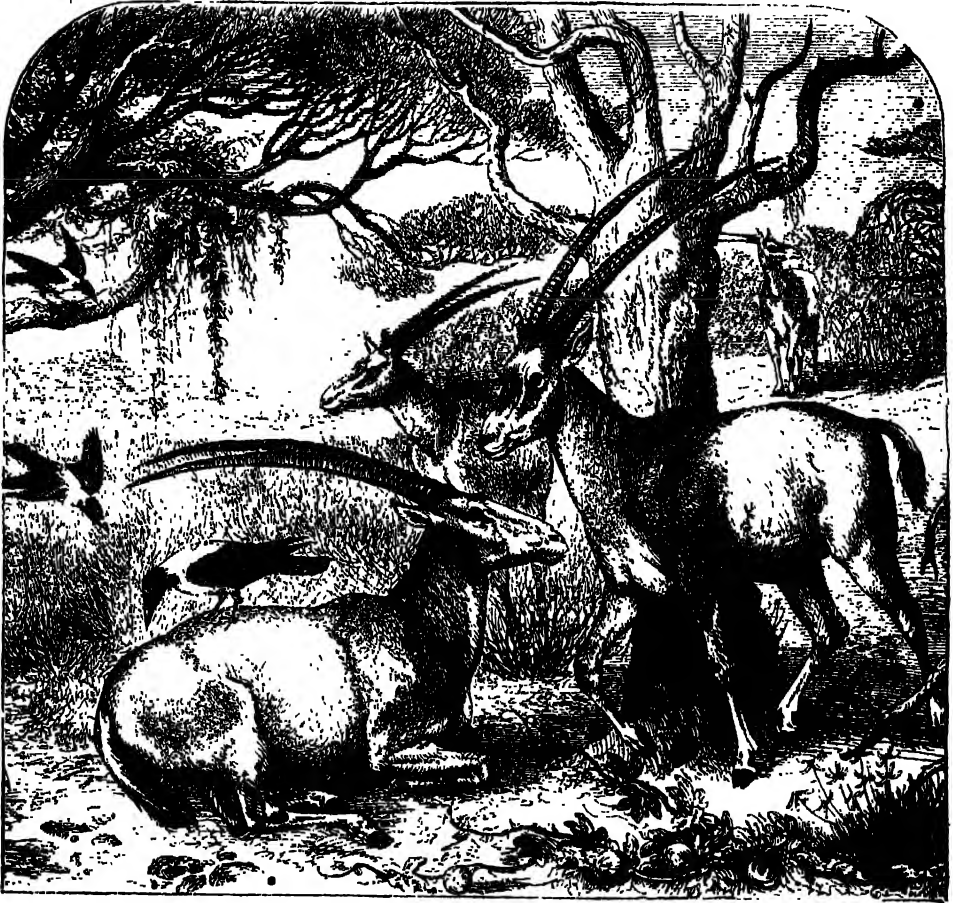
Huntsmen and travellers speak with unqualified rapture of the numbers and variety of what they call the large game, which congregate in the neighbourhood of the drinking fountains in the kloofs, or glens, and valleys of Southern Africa.

They are the meeting-places of elephants, buffaloes, giraffes, and numerous species of antelopes. "The wild ass also"—the quagga of travellers—"quenches his thirst" at these reservoirs, which a beneficent God has provided, "to give drink to every beast of the field."

Among the impressive spectacles wit-

nessed in these regions, the migrations of some of the antelope tribe are not the least astonishing. *

At certain periods the springer antelope migrates in myriads from unknown districts in the interior towards the abodes of civilization. A writer, who more than once had an opportunity of witnessing these migrations,



was so astonished with the sight that he seems unable to convey any adequate idea of the hordes which pressed onward in countless succession. On one occasion he passed through one of these migratory swarms pouring in from the north in such enormous troops that no one could venture on a computation of their numbers. But as they pressed onwards, band following band, they seemed to whiten the whole expanse of country, far as the eye could reach. And

taking the very lowest estimate, he affirms that within view there could not be less than thirty thousand of these elegant creatures!

The beautiful quagga also migrates in bands of several hundreds from the neighbourhood of the tropics towards the south. The bands follow in regular succession, and though the number of each is somewhat limited, the aggregate of the whole host is numerous beyond all computation.

PRESIDENT THIERS.

LIKE Lord Palmerston, M. Thiers was fresh and vigorous at an age when most men who have attained it are content to sit in the chimney-corner, and allow a younger generation to busy themselves with worldly affairs. Consequently, although half-way towards his eighty-first birthday, he seemed to have been cut off prematurely. Moreover he passed away at an important epoch in his country's annals. For years he was the most prominent Frenchman, and recent events added to that prominence. A struggle was in progress between those who desired to retain the Republic as a permanent institution, and those who desired to replace it by some monarchical form of government; and it was confidently expected by the Moderate Republicans that, if Marshal MacMahon failed to satisfy the requirements of the majority of Frenchmen, M. Thiers would once more resume the chieftainship of the State. These expectations were destined to be for ever unfulfilled. M. Thiers, who was staying at St. Germain, near Paris, had shown symptoms of alternate restlessness and drowsiness, but his friends were not seriously concerned about his health. He pursued his usual occupations, and one afternoon he was to have met some friends, including M. Gambetta, at the house of M. Barthélemy St. Hilaire, in Paris. He failed, however, to keep his appointment, and next day the news was flashed over France that the veteran statesman was dead. After luncheon on the day in question he had been seized with a fit of apoplexy, and died the same evening.

Louis Adolphe Thiers was born at Marseilles, April 16th, 1797. His parents were poor, his father being either a small

locksmith or a dock labourer, but they were fortunate in obtaining for him an exhibition at the public school of his native city, so that he was enabled to receive a good education, and soon distinguished himself by his ability. His first destination was the army, but for some reason or other it was decided to make a lawyer of him, although all through life M. Thiers, despite his shortsightedness and small stature, displayed strong military instincts. At the bar M. Thiers met with no success. So, like many another briefless barrister, he turned to literature, which he found a far more congenial pursuit.

Charles X. was then treading the same fatal path which led our Charles I. to ruin some 200 years earlier, and the vivacious little Marseilles journalist vigorously assailed the King's absolutist pretensions in the columns of the *National*. It was at this time that M. Thiers invented the well-known phrase, *Le roi regne, et ne gouverne pas.* He presently became a man of note, and after the "three glorious days of July," when Charles abdicated, it was he who proposed that the Duke of Orleans should fill the vacant throne. Under the new régime, through the influence of his friend Lafitte, the wealthy banker, M. Thiers obtained a subordinate post in the Finance Department of the Government, having previously been returned as member for Aix. He soon, however, made his presence felt. He undertook the reformation of the French system of finance, and was acknowledged to be one of the ablest debaters in the House.

With several intervening periods of resignation he became in 1832 Minister of the Interior, and in 1836 President of the Council. In 1840 he resigned, having nearly succeeded in causing a war between France and England over the Syrian affair. The chief other events which signalised his tenure of power were the suppression of

the Lyons insurrection and the transportation of the remains of Napoleon from St. Helena to France. M. Thiers had already achieved literary renown by his "History of the French Revolution," which he began in 1823, and which he now followed up, being relieved from the toils of statecraft, by his "History of the Consulate and Empire," which was completed in 1862. During the stormy period which dated from the Revolution of February, 1848, M. Thiers was an active member of the Constituent, and afterwards of the National Assembly. At first he favoured Louis Napoleon, but afterwards, having divined the Prince-President's intention of seizing the supreme power, he opposed him stoutly, and was rewarded at the time of the *coup d'état* by being sent to Mazas prison, and then banished the country. His exile did not last long, and he judiciously spent the interval in visiting battle-fields for the purposes of his History. M. Thiers was now getting well on in years, and, had his lot been that of most men, would probably have passed the rest of his days in comparative obscurity. And, in fact, he was laid on the shelf till 1863, when, to the astonishment of middle-aged men who remembered him as a Minister when they were children, he burst into notice as a brilliant debater in the Chamber, and as an uncompromising opponent of the Government. The power of Napoleon III. was then beginning to decline, and the merciless assaults of the old ex-Orleanist Minister helped to quicken his ruin.

M. Thiers opposed the war with Germany in 1870, not as being wrong in itself, but as undertaken at the wrong time. During the disasters of that terrible year M. Thiers rose rapidly into favour with his countrymen. He was the only man of mark who had not served the detested "Badinguet"; he strove, though unsuccessfully, to make terms with Bismarck in October; and he successively

visited, in the depth of winter, England, Austria, Italy, and Russia, seeking vainly for an ally against the Germans. He was now declared Chief of the Executive Government, and in February the terms of peace were arranged. M. Thiers strove his utmost, but the conditions were severe. France was mulcted of two provinces, and had to pay a fine of £200,000,000; the invader to remain on her soil till the last farthing was paid. M. Thiers manfully set to work to raise the money, but his plans were temporarily deranged by the Communist insurrection of March. He had to fly from Paris, which was retaken two months later by fire and sword. As soon as peace was restored M. Thiers resumed his financial labours; he issued a loan, which was subscribed fourteen times over, and he paid off the tremendous indemnity with such ease that the astute Bismarck, it is said, almost wished (*à la* Oliver Twist) that he had asked for more.

On August 31, 1871, the Assembly changed M. Thiers' designation to "President of the French Republic," and prolonged his tenure of office. He devoted himself with the utmost energy to the reorganization of the army and the evacuation of the territory. Had his countrymen been wise (which politically they rarely are), they would have let him stop in office; but the Monarchists became alarmed at the President's acknowledged preference for a Republican form of Government, as being the one which "divided Frenchmen the least"; the various factions combined against him, and on the 24th May, 1873, overthrew him, and replaced him by the Conservative MacMahon. Since then M. Thiers remained personally in the background; but he did not cease to be a power in France, and since 1870 had conferred such momentous benefits on his native country that all Frenchmen who prefer patriotism to party will remember his name with perpetual gratitude.



THE TUNNEL UNDER THE SEA.

SINCE the successful completion of the Mont Cenis tunnel, attention has been drawn to the practicability of a railway tunnel under the English Channel. In this age of scientific engineering, many things once deemed impracticable have become accomplished facts. And it really seems that the time will come when travellers between England and France, or *vice versâ*, will be able to accomplish their journey without liability to the sea-sickness now so much dreaded.

But a tunnel under twenty miles of sea presents, of course, special difficulties in its formation. However, the commercial world has been roused to a sense of the need of such an undertaking; scientific men have apparently proved its possibility, and financiers have come forward with the necessary funds for making a beginning. The respective Governments of the two countries concerned have also made amicable arrangements.

From preparatory soundings of the Channel it has been clearly shown that under the shifting gravel, sand, etc., the geological strata lie uninterruptedly across from Dover to near Calais, and that there are only very slight alterations in the level. Preliminary operations have been commenced on both shores; for of course in a work of such magnitude there is a good deal to be done in the way of shaft-sinking, and so on, before the actual tunnel under the sea can be commenced.

Among English men of science connected with the undertaking, Sir John Hawkshaw has taken the lead. He designed the instruments used in taking the soundings. By these instruments specimens were cut from the real bottom of the Straits, which

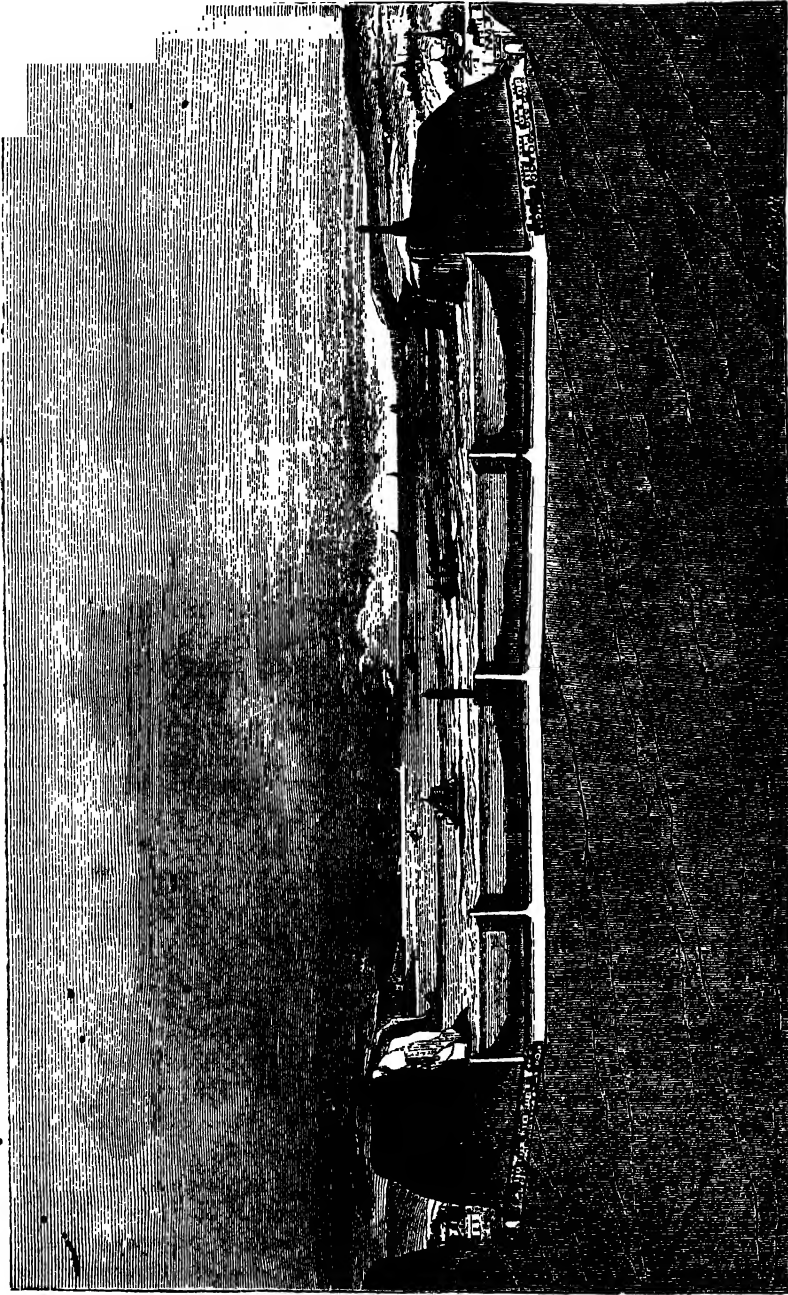
is usually covered with gravel, mud, and stone. Each instrument consists of a steel tube, the lower end having a sharp edge, and the upper portion being perforated with holes to allow water and ooze to escape. These tubes are made of various lengths and diameters; when used, one of them is fitted into the collar of the sounding lead, which is sufficiently heavy to aid the instrument in cutting through the loose layers. The sounding line, constructed of the best hemp, has to be watched with great care. It is wetted, stretched, and measured, at the commencement and termination of each day's work.

The machine intended for the actual formation of the tunnel is the Brunton boring machine, so called after its inventor. It will in the first place hollow out an aperture about seven feet in diameter. This will be subsequently enlarged, and well secured with a lining of masonry. The machine has already been used in this country, with important results. Through soft materials like chalk it advances rather more than a yard in an hour, and it is calculated that two years will suffice for the machine to penetrate from England to France under the English Channel.

The actual cutting of the rock is produced by an ingenious arrangement of sharp revolving discs in very rapid rotatory motion. The angle at which these discs are set is varied to suit circumstances. The whole machine is arranged to progress forward as the path is cut for it by the discs in front. Long arms fitted to wheels gliding on rails, and other mechanical contrivances, give the requisite stability as well as motion forward. There is also a large drum enveloping the cutting discs and receiving the *débris* as it falls. This *débris* is passed along under the machine by means of an endless band, and shot into a wagon in the rear.

Respecting this undertaking, a sanguine French writer says: "We have confidence in the ultimate success of this gigantic enterprise: yesterday it was a dream; to-

day it is a project; to-morrow it will no doubt be a reality. We allow that we are enthusiastic in our admiration of such powerful manifestation of the industrial genius



PROPOSED SUBMARINE TUNNEL BETWEEN DOVER AND CALAIS.

of our time. In his struggle with nature man has ventured to re-unite seas, to pierce through mountains, and now he has resolved

that he will cross the ocean dry foot, and he will cross it. The wonders of the age are not yet exhausted."

CURIOUS FISHES.

SINGING AND NEST-BUILDING FISHES.



IF an oyster can whistle, there is really no reason in the nature of things why a fish should not sing; and it seems that there are some fishes—in American waters, of course—that actually do sing. A learned Transatlantic naturalist, who has bestowed considerable attention upon the habits of the so-called bearded drum-fish, is convinced that it has the power of uttering a distinctly audible note. "Strange sounds are often heard rising from the waters of our coast that would be apt to astonish the superstitious listener if he were not acquainted with the unoffending cause of all the disturbance. Sometimes it rises in the air like the bang of a huge drum, and again it seems to steal over the waters with a low, murmuring wail; and if you were to place your ear close to the surface the strange sounds would appear to come from five or six different places. Seamen are often startled by the 'boom, boom,' that seems to steal, sounding to their ears more like the drum of some long-lost crew than the voice of an insignificant member of the family of fishes." The musical animal is, it seems, a large species of ray, which, by some means at present unknown, has a power of producing those extraordinary sounds. The sharp, shrill note of the cicada and of other insects of the grasshopper tribe is produced by smartly rubbing together the horny wing-cases that cover in the true wings, and it is probable that the booming note of the bearded drum-fish is produced in some similar way by the large fins with which the creature is fringed.

Other denizens of the water have vocal powers equally remarkable. The common red gurnet, so frequent on the Devonshire coast, utters an audible squeak of expos-

tulation when it is taken from the water; and Devonshire fishermen call it, in consequence, the cuckoo fish. The noisy malgree, which is caught along the whole eastern line of the American coast, makes a strange cooing moan, accompanied by a sharp croak, like that of a frog. These sounds can be heard on the surface when the fish itself is a hundred and fifty feet below, and are probably produced by the large pectoral fins that lie on each side of its head.

Lastly, in the Gulf of Mexico is to be found a fish, known as the "grunt," which is not only capable of lifting up its voice, but of actually using it and modulating it to express various shades of feeling and emotion.

"I shall never forget," says this naturalist, "the first one of these veritable 'porkers' that I caught." No sooner was the fish fairly brought to hook than he commenced a series of sobs so pitiful and heartrending that the tenderer feelings of the fisherman triumphed over the instinct of sport. He could not find it in his heart to kill a creature that begged so piteously for its life. "My better nature was aroused, and I made haste to toss him back; and as he disappeared he uttered a squeak which, together with the splash, sounded to me like a *bonâ fide* 'thank you!'"

It seems odd to think of fishes building nests; yet so varied are nature's arrangements that there are inhabitants of the waters who rival the birds of the air in their nest-building. One of these is the most common of our British fishes—the tiny stickleback. This little creature constructs a perfect nest, in which it deposits its eggs, and over which it keeps watch and ward till the tiny family is able to enter on the responsibilities of stickleback-life. Such precautions are unusual among the finny tribes, whose eggs are generally left to chance, or, in some cases, adhere to friendly weeds till they hatch

out, and the young ones face life in the world of waters, without a parent's care to guide them. The lordly salmon makes an apology for a nest by scooping out a hollow or "redd" in the gravel bed of the stream which it ascends for the purpose; but this, compared with the beautiful workmanship of the stickleback, is as the rook's collection of sticks to the mossy ball prepared by Jenny Wren for her bantlings.

The instances of nest-building fishes are rare, and it is among tropical species that the majority of them occur. One of these, whose lovely colours have caused it to be christened the "rainbow fish," is very beautiful. Monsieur Carbonnier, a French naturalist, has given an account of this process.

As in the case of the stickleback, it is the male fish which performs the principal duties of nurse and cradle-keeper; but the nest of the rainbow fish differs from that of the stickleback in the fact that it floats on the surface of the water, whereas the latter is built among the weeds beneath. The approach of breeding-time is marked by the increasing beauty of colour in the male fish, who dons his best robes in order to find favour in the eyes of his mate. His scales then assume all the varied tints of the rainbow, every movement causing them to scintillate with a metallic lustre and ever-changing hue, now flashing forth with increased splendour, now dying away for a moment, only to reappear with greater variety and intensity of colour. But his time is not all given to courting. He enters on the duties of his prospective position with vigour, and his instinct amounts almost to sagacity. When the weeds are of a kind which will not float, the fish tears off bits of the leaves in his mouth, and expels them towards the surface; but if their specific gravity is too great, and his efforts are unavailing, he seeks for plants of a finer texture, and then renews his attempts with success. But the fish is too cunning an architect to trust to the natural flotation of his building materials, and, after placing a few pieces

together in position, he forms several air-bubbles in a viscid secretion, which he is able to eject from his mouth, and places them in contact with his floating nest. Just, in fact, as engineers raise ships by means of immense air-bags, the rainbow fish forms *his* air-bags and attaches them to his ship as a precautionary measure, to prevent its sinking.

Day by day the work of knitting together the little morsels of weed progresses, till a floating domed island three inches in diameter is formed (the fish itself is not more than half that length); but this is, so to speak, only the foundation of the edifice, the roof being in reality constructed before any other part. Beneath this roof a complete circular nest is built, which the fish welds together with the greatest industry and patience; and not till it is complete does he seek his companion. All this time the female has kept aloof, neither assisting her companion nor encouraging him by her presence in the work of nidification. But now she is induced to visit the home of her future progeny, and the labours of the exemplary parent are redoubled.

When the minute eggs are laid, the male fish collects them in his mouth, and places them carefully within the nest, which he continually supports with fresh bubbles, lest the precious cargo should outweigh it. When all is safe, he stations himself on guard before the only opening in the nest, and awaits the course of events, ready to defend his handiwork against all comers, while his better-half retires altogether from the scene. In about three days the eggs begin to hatch out. The parent fish then destroys a number of the supporting air-bubbles, causing the nest to sink deeper into the water, so that none of the young ones may be "drowned" for want of water. As long as he can, he prevents them from escaping from the paternal roof; but their strength rapidly increases; and, just as boys and girls leave home to better themselves, the young rainbow fish burst from the father's apron-strings and are soon exulting in their new-found freedom.



A SWEDISH IRON MINE.

THE celebrated traveller Dr. Clarke thus describes his impressions of a visit to one of the gloomy iron mines of Sweden :—

“For grandeur of effect, filling the mind of the spectator with a degree of wonder which amounts to awe, there is no place where human labour is exhibited under circumstances more tremendously striking. As we draw near to the wide and open abyss, a vast and sudden prospect of yawning caverns and prodigious machinery prepared us for the descent. We approached the edge of the dreadful gulf whence the ore is raised, and ventured to look down; standing on the verge of a sort of platform constructed over it in such a manner as to command a view into the great openings as far as the eye could penetrate amidst its gloomy depths, for to the sight it is bottomless. Immense buckets suspended by rattling chains were passing up and down; and we could perceive ladders scaling all the inward precipices, on which the work-people, reduced by their distance to pigmies in size, were ascending and descending. Far below the utmost of these figures, a deep and gaping gulf, the mouth of the lowermost pit, was, by its darkness, rendered impervious to the view.

From the spot where we stood, down to the place where the buckets are filled, the distance might be about seventy-five fathoms; and, as soon as any of the buckets emerged from the gloomy cavity we have mentioned, or until they entered into it in their descent, they were visible, but below this point they were hid in darkness. The clanking of the chains, the groaning of the pumps, the hallooing of the miners, the

creaking of the blocks and wheels, the trampling of horses, the beating of the hammers, and the loud and frequent subterraneous thunder from the blasting of the rocks by gunpowder, in the midst of all this scene of excavation and uproar, produced an effect which no stranger can behold unmoved.

We descended with two of the miners and our interpreter into this abyss. The ladders, instead of being placed like those in our Cornish mines, on a series of platforms as so many landing places, are lashed together in one unbroken line, extending many fathoms, and being warped to suit the inclination or curvature of the sides of the precipices, they are not always perpendicular, but hang over in such a manner that, even if a person holds fast by his hands, if his feet should happen to slip, they would fly off from the rock, and leave him suspended over the gulf. Yet such ladders are the only means of access to the works below; and as the labourers are not accustomed to receive strangers, they neither use the precautions nor offer the assistance usually afforded in more frequented mines. In the principal tin mines in Cornwall, the staves of the ladders are alternately bars of wood and iron; here they were of wood only, and in some parts rotten and broken, making us often wish, during our descent, that we had never undertaken an exploit so hazardous. In addition to the danger to be apprehended from the damaged state of the ladder, the staves were covered with ice or mud, and thus rendered so cold and slippery that we could have no dependence on our benumbed fingers if our feet failed us. Then to complete our apprehension, as we mentioned this to the miners, they said, “Have a care; it was just so, talking about the staves, that one of our women fell about four years ago as she was descending to her work.”

“Fell!” said our Swedish interpreter,

rather simply, "and pray what became of her?"

"Became of her!" continued the foremost of our guides, disengaging one of his hands from the ladder and slapping it forcibly against his thigh as if to illustrate the manner of the catastrophe, "she became a pancake!"

As we descended farther from the surface, large masses of ice appeared covering the sides of the precipices. Ice is raised in the buckets with the ore and rubble of the mine. It has also accumulated in such quantities in some of the lower chambers, that there are places where it is fifteen fathoms thick, and no change of atmosphere above prevents its increase. This seems to militate against a notion, now becoming prevalent, that the temperature of the air in mines increases directly as the depth from the surface, owing to the increasing temperature of the earth under the same circumstances, and in the same ratio. But it is explained by the width of the aperture at the mouth of the mine, which admits a free passage of atmospheric air.

In most of our Cornish mines, ice would not be preserved in a solid state at any considerable depth from the surface.

After much fatigue, and no small share of apprehension, we at length reached the bottom of the mine. Here we had no sooner arrived than our conductors, taking each of us by the hand, hurried us along through regions of "thick ribbed ice" and darkness into a vaulted level through which we had to pass into the principal chamber of the mine. The noise of countless hammers, all in vehement action, increased as we crept along this level; until at length, subduing every other sound, we could no longer hear each other speak, notwithstanding our utmost efforts to do so.

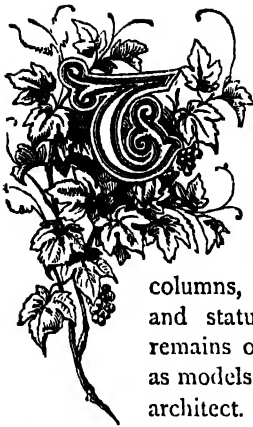
Just at this moment we were ushered

into a prodigious cavern whence the sound proceeded; and here, amidst falling waters, tumbling rocks, steam, ice, and gunpowder, about fifteen miners were in the very height of their employment. The magnitude of the cavern, over all parts of which their labours were going on, was alone sufficient to prove that the iron ore is not deposited in veins, but in beds. Above, below, on every side, and in every nook of this fearful dungeon, glimmering tapers disclosed the grim and anxious countenances of the miners. They were now driving bolts of iron into the rocks, to bore cavities for the gunpowder for blasting. Scarcely had we recovered from the stupefaction occasioned by our first entrance into this pandemonium, when we beheld, close to us, hags more horrible than perhaps it is possible for any other female figures to exhibit, holding their dim quivering tapers to our faces and bellowing in our ears. One of the same sisterhood snatching a lighted splinter of deal, darted to the spot where we stood, with eyes inflamed and distilling rheum, her hair clotted with mud, half-naked, and with such hideous yells as it is impossible to describe. If we could have heard what she said, we should not have comprehended a syllable; but as several others, equally Gorgonian in their aspect, passed swiftly by us, hastening tumultuously towards the entrance, we began to perceive that if we remained longer in our present situation, Atropos might cut short the thread of our existence; for the noise of the hammer had now ceased, and a tremendous blast was near the point of its explosion. We had scarcely retraced with all speed our steps along the level, and were beginning to ascend the ladder, than the full volume of the thunder reached us, and seemed to shake the earth itself with its terrible vibrations."





RUINED TEMPLES IN THE ACROTOLIS.



THE RUINS IN THE ACROPOLIS.

THE Temples of Minerva, Neptune, Theseus, and others, in the Acropolis at Athens, have long been subjects of admiration; their columns, external sculptures, and statues within, or what remains of them, still serving as models to the sculptor and architect. The Athenians could also boast of their public institutions—their theatres, baths, and monumental trophies—most of which were formed of the finest Pentelic marble, and erected in the most classic styles that the fertile but chaste imagination of Greece could produce.

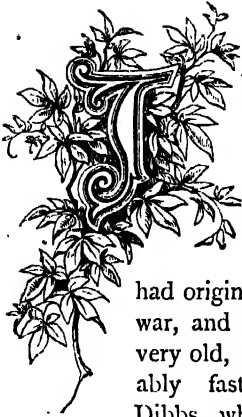
The Acropolis is about the centre of the existing city; and is formed of an enormous rock, with a flat summit about a thousand feet in length, and five hundred in breadth. On all sides except the west the rock is perfectly perpendicular, and has several grottoes cut out in its surface. On the west, which is the only easy road, the height is approached by a slight declination which falls into the Agora, or lower portion of ground, and which is considered the most honourable portion of the city, and fills up the space that intervenes between the Pnyx, the elevation on which public meetings were anciently held, and the Areopagus on which the sacred council sat. On the top of this rise, leading to the Acropolis, stands the Propylea or gateway, a magnificent structure, built of marble brought from Mount Pemelicus, and which served both as an approach and military defence to the citadel.

"The chief glory of the Acropolis," says a modern writer, "was undoubtedly that of the Parthenon, or Temple of Minerva. It was of the Doric order, with seventeen columns on the sides, each 6 feet 2 inches in diameter at the base, and 34 feet in height,

elevated on three steps. Its height from the base of the pediment was 65, and the dimensions of the area 233 by 102 feet. The eastern pediment was adorned with two groups of statues, one of which represented the birth of Minerva, the other the contest of Minerva with Neptune for the government of Athens. On the metopes was sculptured the battle of the Centaurs with the Lapithæ; and the frieze contained a representation of the Panathenaic festivals. Ictinus, Callocrates, and Carpion, were the architects of the temple; Phidias was the artist; and its entire cost has been estimated at one and a half million sterling. Of this building eight columns of the eastern front, and several of the lateral colonnades, are still standing. The sculptures with which it was enriched constitute the chief portion of the matchless Elgin marbles at the British Museum, obtained by the English ambassador to Turkey (the Earl of Elgin) between the years 1801 and 1812, and afterwards purchased by the English Government for £35,000.

The Parthenon, dilapidated as it is, still retains an air of inexpressible grandeur and sublimity; and it forms at once the highest part in Athens and the centre of the Acropolis. The Temple of Theseus is regarded as one of the most noble remains of the ancient magnificence of Athens, and the most perfect, if not the most beautiful, existing specimen of Grecian architecture. It is built of Pentelic marble; the roof friezes and cornices still remain; and so gently has the hand of Time pressed upon this venerable edifice that the first impression of the mind in beholding it is doubt of its antiquity. The statue of Minerva, executed by Phidias after the battle of Marathon, and placed near the gate of the Acropolis, was a colossal sculpture, the height, including the pedestal, being about 60 feet.

ESCAPE FROM A PIRATE.



It was in 1829 that my father embarked at Sydney to bring his family to England in a vessel called the *Lady Mary*, which had originally been a man-of-war, and which, though now very old, was still a remarkably fast sailer. Captain Dibbs, who commanded her, had also at one time been a lieutenant in the navy, in which he had distinguished himself, but, being destitute of interest, and having a wife and large family to support, he had been compelled to enter the merchant service on the termination of the war, when his services were no longer required. There were a number of passengers in the saloon, and of these fifteen were men; while forward it chanced that there were some half-dozen invalided or discharged soldiers, returning home from the regiment in Sydney, in addition to the ordinary steerage passengers; so that altogether we had, with the ship's crew, between thirty-five and forty men on board. The number of women and children was also very considerable.

One forenoon, as Captain Dibbs was coming out of his cabin into the saloon, holding in his hands the apparatus necessary for taking the day's observations, the daughter of one of the passengers, who was chasing one of the other children round the table, came into violent contact with him, very nearly causing him to drop the chronometer he was carrying. It was preserved from falling, but at the cost of a violent shake, which the captain subsequently found had seriously affected its rate of going, and, as it happened to be the only trustworthy instrument he had, he became uncertain as to his longitude. When, therefore, one morning, shortly before daybreak, a vessel

was sighted, which from the course she was steering, it was evident had only lately left land, he determined to speak her and ascertain his true position; for he was approaching the Abrolhos shoals, and did not know whether he was to the east or west of them. She was about three miles off when first seen, steering across the *Lady Mary's* bows, being apparently bound from Brazil to the Cape. Captain Dibbs therefore altered his course, so as to intercept her; but upon observing this, the stranger, to the surprise of the captain, suddenly altered his course also, and crowded all sail, with the evident object of avoiding a meeting. Such was the superior speed of the *Lady Mary*, however, that she rapidly lessened the distance between them, and, day soon breaking, both vessels could more plainly distinguish each other, when the stranger as suddenly took in sail and hove to, and on reaching her, a boat was sent on board, when this seemingly strange behaviour was explained. And a most providential thing our meeting was, as the result will show, while the stumbling of a playing child was the means, in the good providence of God, of saving us from a terrible calamity.

It appeared that the stranger, who was originally from Nova Scotia, having visited the West Indies on her way, and sailing last from Bahia, had narrowly escaped being seized by a piratical vessel only a few days before. It happened most fortunately that, when at Jamaica, the *Nova Scotian* had heard some rumours of ships missing, and supposed to have been captured and destroyed by a craft asserted to be an American-built schooner, which had been seized the previous year by a gang of desperadoes, headed by her second mate (a man well known on the coast of Cuba, where it happened), who had murdered the captain and crew, and then set sail on a piratical cruise. She was not supposed as yet to be very heavily armed, but was crowded with men,

having succeeded in picking up a numerous crew of ruffians, the offscourings of Mexican and South American ports she was known to have visited : and when the *Nova Scotian* left, the admiral of the station was about to fit out an armed vessel to go in search of her, as he happened to have none in the squadron suited for the purpose, or likely to catch her ; and on the very day before he sailed, a very fine brig from Vera Cruz anchored in Port Royal, which had actually been chased by this pirate ; and thus an authentic description of her appearance was obtained.

Thus forewarned, they had set sail for Pernambuco and Bahia ; and when, a week after leaving the latter place, they one morning fell in with a schooner, with her fore-topmast apparently gone, and otherwise seemingly damaged by a gale, making signals of distress, the commander of the *Nova Scotian*, full of suspicion, took a long look at her through his glass, and at the end of his inspection came to the conclusion that it was a snare intended to lure him to his destruction, and crowded all sail to escape, quickly followed by the pirate, who repaired her seeming damages with marvellous speed and would have inevitably captured his prey had not a gale sprung up, which carried his topmast away in reality. The gale was succeeded by a calm of several days' duration ; and, on the *Nova Scotian* seeing our vessel endeavour to cut her off, we were thought, in the uncertain light, to be the pirate who was supposed to have followed her. When daylight showed our build and rig, however, she had waited for us.

This was serious news for Captain Dibbs, whose course would bring his vessel in the neighbourhood of the pirate's cruising-ground. It was feared that no mercy would be shown, for none of the crew of the missing ships had ever been heard of afterwards, and it was conjectured that they had been destroyed with their vessels. All hands, therefore, passengers and sailors, consulted together, and it was determined to resist to the last, should they be so unfortunate as to fall in with the buccaneer.

The *Lady Mary* had some guns—two twenty-four pound carronades and two long nine-pounders—as well as a tolerable supply of muskets and cutlasses ; and the presence of the few soldiers on board suggested to Captain Dibbs a ruse which, he hoped, would, if he met with him, inspire the pirate with a wholesome fear of coming to close quarters. Amongst the ship's stores was a bale of red shirts, such as sailors wear ; and these were distributed to the male passengers and some of the crew, after the women on board had made them resemble, as closely as possible, soldiers' uniforms. A spar also was sawn up, and the pieces neatly painted, so as to resemble guns, which were placed in the empty ports, and these, at a distance, gave the ship a formidable appearance.* Cutlasses were sharpened ; muskets and pistols cleaned and oiled, and ropes hastily and roughly platted, so as to form a rude kind of boarding-nettings ; and, in fact, all the means which Captain Dibbs's naval experience could suggest were at once adopted to protect his ship and passengers from the ruthless desperadoes who were lying in wait for them.

I well remember the interest with which I and my brothers and the other boys watched these preparations, and the working of the great guns as they were loaded and fired by the sailors, several of whom, like their commander, were old man-of-war's-men. While the latter, formed into crews, exercised the larger weapons, the passengers, under the tuition of the soldiers, practised with the small arms, the weather affording an excellent opportunity for the work of preparation, as it remained either quite calm, or with very light head-winds, for nearly a week. But our chief hope of escape lay in the sailing qualities of our ship, in which the captain placed much confidence.

On the evening of the sixth day after our meeting with the *Nova Scotian* the weather changed, a strong southerly wind having set in, and the *Lady Mary* once more bounded through the water on her home-

ward voyage. This lasted for several days, when again the breeze became light and baffling, often dying away altogether, much to the chagrin of our captain, not only because he was naturally most anxious to sail quickly from so dangerous a neighbourhood, but also because, in light winds, small schooner-rigged vessels have an advantage over large ships, though the latter are always superior in high winds and heavy seas, when smaller craft dare not carry much sail. He paced the deck day and night, scarcely ever leaving it except for an hour or two's rest; for the responsibility was fearful, having so many looking to him as the only means under God for saving them from the danger which menaced them. A vigilant look-out was kept up, several men being stationed with night-glasses at the mast-heads; and, in addition to exercising his crew and passengers incessantly in the best method of resisting any attempt at boarding, a quantity of grease and oil was prepared and kept ready to smear the sides of the ship and the shrouds and ropes by which the pirates would try to mount up. Fortunate was it for the passengers of the *Lady Mary* that they had a man of such prudence, experience, and forethought to take care of them as Captain Dibbs proved himself to be.

Just after sunset the look-out at the mast-head reported a schooner right ahead, and steering the same course as ourselves. In ordinary circumstances no notice would have been taken of so common an occurrence; but the sharp look-out now kept up showed that after dark the stranger had altered his course, so as to get out of the track of the *Lady Mary*, and then, furling all his sails, had allowed the latter to go past her. From his own naval experience of the different kinds of artifices used by smugglers and privateers, Captain Dibbs suspected that some manœuvre of the kind might be practised, and ordered that a strict look-out should be kept astern and abeam.

The moon did not rise until after midnight; but the night was starlight above, though clouds hung about the horizon,

making it difficult to distinguish the outline of any vessel, unless pretty close. But at ten o'clock the vigilant watch kept up suddenly revealed to the sharp eyes of the seamen the form of the pirate about a mile away, on the *Lady Mary's* quarter. She had just spread her sails again, and was now coming fast up, intending to run alongside and throw her crew on our decks. It was blowing a three-knot breeze only, and the schooner consequently overtook the larger vessel with the greatest ease, although the latter kept all her studding-sails set, until, finding they were of no use as aids to escape, the captain ordered them to be taken in, as they would prevent the quick working of his ship in action.

This order was executed just as the pirate had approached to within musket-shot of the *Lady Mary*, fancying herself still unobserved; but Captain Dibbs suddenly hauled his wind, and crossing his pursuer's bows, hailed with a speaking-trumpet, threatening to fire into her if she came any nearer. Utterly disconcerted at this unexpected salute, and at finding herself detected and her character apparently known, the schooner dropped astern for awhile, as if desirous of making us out before venturing nearer; but gradually she again crept up. The night was calm, with a smooth sea, and the moon shortly rising, showed the towering sails of the schooner glistening in her beams not more than three hundred yards distant. Not a sound issued from her, and one solitary form, that of the man who steered, could alone be distinguished on her decks. Perhaps they thought Captain Dibbs's threat an empty one; for at last the distance between the two vessels was barely a hundred yards, and it became necessary to act decidedly, although the *Lady Mary's* commander was very loth to commence hostilities; for he had not the means of making any prolonged resistance, his supply of ammunition for the great guns being very limited.

As soon as he found that the schooner had dropped astern of him, he had ordered all four of the guns to be moved to one side

of the ship; and now finding that the pirates, after yawing about some time undecidedly, at last seemed to make up their minds to come alongside, he determined to show them that he had the means of resistance. Again suddenly shifting his helm, so as to bring his guns to bear, he deliberately fired all four, coolly and steadily, taking care that they should be well aimed. Two of the shots passed through her mainsail, one of them cutting the halyards and letting the sail down by the run, while a crash, and the sudden appearance of white streaks of splinters in her black hull, showed that the others also had reached their mark. At the same moment, by previous command, all hands, crew and passengers, joined together in a lusty cheer. This, with the fact that the four guns were fired from one side of the ship only (leading to the impression that she was armed with eight altogether), so staggered our pursuers, that they again dropped astern without attempting to return the fire.

When daylight came the pirate again drew ahead, and sailed past us with an ease which showed how futile all hopes of our escaping by superior speed would have proved. She seemed a vessel of about two hundred tons; but no guns could be seen, except one just behind the foremast, amidships, and another astern, neither of which, so far as Captain Dibbs could make out, were long ones—a circumstance for which he was inexpressibly thankful, as, had it been otherwise,—had the buccaneer been mounted with a long thirty-two pounder, he could have chosen his own distance and battered us to pieces at his leisure, while the shot from the *Lady Mary's* nines and carronades would not have reached half-way.

It was afterwards ascertained that she was crowded with men; and could she have succeeded in boarding us, our chances would have been small indeed,—the plan generally followed by the pirate being to avoid all prolonged cannonading, for fear of attracting the notice of any passing cruiser, and trust principally to stratagem to capture his prey. All day he prowled

about us, keeping, however, at a respectable distance, the experience of the preceding night, and the numerous uniforms visible through his glasses on our decks, doubtless inducing him to avoid coming to too close quarters. Our “quakers,” or wooden guns, also, could not be distinguished from real artillery at such a distance; and finally, towards the afternoon, having thoroughly examined the *Lady Mary*, who kept on under easy sail, apparently ready for all emergencies, he evidently made up his mind that she was too hard a nut for him to crack. Spreading all sail, she stood away to windward, and shortly before sunset had disappeared below the horizon, to the inexpressible relief of the passengers, particularly of the women and children who had spent a most wretched day between-decks, in the stifling hot cabin, listening to every sound above, and every instant expecting to hear the roar of the guns commence the deadly strife in which husbands, brothers, and sons were to be engaged.

Darkness set in with the suddenness peculiar to the tropics; and, after a day and night of much anxiety and suffering, the women retired very early to rest, as had been the case for several days. The breeze died away after sunset, and the *Lady Mary* once more lay becalmed. The night was much darker than the preceding one had been, dense clouds covering the heavens, and resting in masses against the north-western horizon, where a stiff breeze was evidently brewing. The gentlemen passengers were about to follow the example of the women, and turn in early; when, to their surprise, the captain in a low voice expressed a wish that they should not retire just yet, as he wanted to speak to them on deck first; and rising from the table where they were sitting, he led the way up on the poop. It had been noticed that while all around him were in the highest spirits at their escape from the danger which had threatened them, Captain Dibbs alone remained silent and abstracted, and the now happy party at the dinner table had rallied him in consequence; but,

upon reaching the poop, they ascertained the cause of his uneasiness, and found that their own exultation had in all probability been premature.

"I did not wish the women to know it, poor things," said the captain; "let them sleep in peace; but I must inform you, gentlemen, that, so far from having left us for good, I believe that vagabond is at this very moment somewhere near us. It is true he had been out of sight some time at sunset; but suppose, instead of sailing on, he had hove-to and waited till dark. The breeze lasted till after eight o'clock; so that, if he had chosen to return, it would have brought him down to somewhere in our neighbourhood,—within a mile or two, indeed,—allowing him to have been, say, ten or twelve miles off. So that you see we must keep in readiness. I did not like it at all when I observed that he went off to windward, and I suspected instantly what he would be up to. All lights that can be seen have been put out, and the most perfect silence must be preserved. We ought to be thankful for this calm, for in it he can do nothing, unless he is near enough to attack us with his boats; but the night is too dark and the risk too great for that, I think; for there is every appearance of a stiff breeze shortly."

This information banished all idea of sleep, and the passengers determined to remain on deck, at least until the moon rose, and they could see about them. Hour after hour rolled by; not a breath of air stirred, and not a star was visible. It was impossible to see more than a few yards, so intense was the darkness. The crew lay sleeping about the decks; and at last most of the passengers, wearied out with two nights' watching, likewise sank down overpowered. About one o'clock the calm was broken by a few catspaws coming from the direction the pirate had disappeared in, and presently the ship once more began to move through the water. My father, with a few others, happened to be standing near Captain Dibbs, who remarked, as this occurred, that, if the schooner was anywhere

close by to windward, she would bring the breeze down with her.

"But, fortunately, it is too dark for him to be able to make out our whereabouts; and here comes the moon at last," he added, as a gleam of light appeared on the eastern horizon; and presently her silver rim rose above the ocean, shining through an opening in the clouds.* As he turned his head from looking at it, once more to gaze to windward, Captain Dibbs started in amazement, and shouted for "All hands to quarters!" for there, betrayed by the beams which, most providentially for us, had appeared some minutes too soon for his designs, was the pirate, with all sail set, bearing rapidly down upon us. But her fell purpose was already frustrated; the breeze she was bringing with her quickly increased in power, and shortly swept past in gusts so heavy that the smaller vessel was obliged to take in sail and abandon the chase; but, had she been ten minutes sooner, she would have been alongside almost before we were aware.

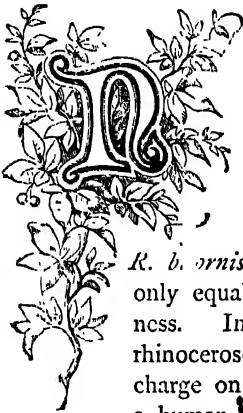
At first it seemed strange that the pirate on so dark a night should have been able to steer so straight for us; but the mystery was explained by the discovery of a light burning below in the cabin of one of the women, who, in ignorance of the peculiar motive which existed for keeping the ship in darkness on that night, had lighted a lamp in her cabin, and knowing that she was breaking the ship's rules, had placed a screen over her door, so that the gleam should not betray her. But her port was open on account of the heat, and the rays, shining over the deep, had nearly caused the destruction of all on board, by guiding the prowler to his prey.

Long afterwards, I was one evening at the house of the late Professor G. of the University of Edinburgh, when the conversation happened to turn on phrenology, and a skull was produced for the inspection of the company which had been brought to England by the professor's brother many years before. When I had heard its history related, I regarded the relic with un-

common interest; for, from dates and other circumstances, no doubt remained on my mind that this was the skull of the commander of the identical pirate which had so nearly captured us. After committing many depredations, and being guilty of numerous fearful atrocities, including the sacrifice of very many lives of the hapless people who fell into his power, his vessel was at length seen and chased by the frigate of which Captain G. was then an officer. Hard pressed, the pirate ran his craft ashore at the Isle of Pines, in the West Indies, and, with his crew, took to the woods, where they were followed and hunted down by parties from the frigate. Obligated to separate from his companions, who were at last nearly all

killed or taken, or starved to death in the woods, the miserable outlaw, left alone, for some weeks led a wretched existence, and at length was found by a party scouring the country in quest of him, lying on the ground in an awful condition. The vengeance of God had overtaken him before that of man. When shooting at some parrots, his gun had burst, shattering his arm and face, blinding, and completely disabling him. For several days and nights he lay there, unable to move, tormented with thirst, tortured by insects, and suffering excruciating pain from his wounds. In the last days of his wicked life he indeed found that truly there is "a God that judgeth in the earth."

RHINOCEROS HUNTING.



o small volume might be filled with anecdotes of the ferocity, chronic bad temper, and cunning of

R. b. ornis. His cunning is only equalled by his viciousness. In most cases, the rhinoceroses will at once charge on getting the wind of a human being; and if they

cross his track, they will often follow it up like a dog, making none of the puffing sound natural to them when angry, till they absolutely see him. When wounded, and occasionally when much disturbed, their spoor consists of parallel straight lines, so that it is next to impossible to overtake them without being discovered, and giving them an opportunity of charging you from one side. They will wait with the utmost patience concealed in thick jungle, until you almost touch them, and then rush out at you. When they do catch an unfortunate being, they knock him down and knead him with their feet, returning again

and again until nothing but a shapeless mass remains, uttering all the while their shrill squeal of rage.

"Five of us," says the Hon. W. Drummond, "consisting of myself, three native hunters, and my gun-bearer, were on our way to join a native hunting party some twelve miles off, and just after crossing a small stream about half-way we saw a flock of rhinoceros-birds hovering over an ukaku thicket, and evidently accompanying some game passing through it. The place was of no great size, so two of the hunters ran round to the farther sides, while I and the remaining one went into it, and, in a few seconds, struck the spoor of an upetyane. I am thankful now to recollect that I at once suggested leaving the vicious brute alone: partly because it was such dangerous work, and its death would do us no good; partly on account of the time it would waste and the distance we had yet to go. However, the hunter wanted to go after it, and to have said more would have implied fear on my part, —a thing one has to guard against when, being the only white man amongst natives



THE WOUNDED RHINOCEROS.

far in the interior, one's comfort, and not impossibly one's life, depends upon one's prestige; and so we went on, and in scarcely five minutes I saw it, having already heard it snorting like a steam engine, trotting along, tossing its head, and looking like mischief personified, having evidently got the wind of some of us, and being quite as anxious to find us as we it. It was about fifteen yards off, and I instantly let drive with both barrels into its shoulder, springing as I did so into the tree under which I was.

My unlucky companion, who was a little distance on one side, and had hitherto only heard it, came running towards the shots, and absolutely met it face to face; he at once fired and turned to run, but it was too late, and he was caught on the spot, thrown up with a single toss, which must probably have stunned him, and was then trampled out of all semblance to humanity by the bloodthirsty brute. Any description would be sickening. I could do nothing, for my gun-bearer had disappeared, seeking safety in some other spot, and I found that I had not a single cartridge left in the little pouch I carried; but after a minute I could stand the inaction no longer, and, getting down from the tree unperceived, I stole away, and, as soon as I was out of reach, began to shout to the others. Two of them soon came up, my gun-bearer and a hunter, one of them having hidden himself on finding the sort of animal we had to deal with; and I having got a supply of cartridges, we went back to the spot until we got sight of the brute, still trampling and squealing, when, kneeling down, we fired at it together.

My nerves had been so much shaken, that I was unsteady and missed clean, not twenty yards off; but the ball from my companion's great elephant gun sped more truly, and the brute fell on its knees, where, by dint of repeated, if not very well-aimed shots, I succeeded in keeping it until he had reloaded, when we finished it off together.

*Other instances of the same sort are not wanting, but that was the only one that ever occurred within my personal knowledge; though, during the time I was hunting, two of my men were killed by rhinoceroses, one by an upetyane, the other by a kulumane; and from what I heard of the details, they must have been very similar. I only know of a single instance of a person escaping with life. A lot of Kaffirs were crossing the Bombo flats, and a woman, carrying her baby on her back in the native fashion, joined the party for protection. During the journey they were charged by an upetyane. Everybody threw down their bundles, regardless of breaking calabashes and pots of fat, and climbed up trees, all except this woman, who, impeded by her burden, and terrified out of her wits, was overtaken and tossed. When she fell again, the rhinoceros came up, sniffed at her and the baby, and walked away, not attempting to do any further harm, and luckily she was only bruised. What had caused it to do this no one knew, and therefore ascribed it to witchcraft. Perhaps the resemblance of the baby's squalling to its own made it so unusually merciful. One killed in Zululand, in 1871, destroyed no less than seven people before its death."

The Indian rhinoceros, like its African cousin, sometimes exhibits almost a rabid fierceness. This was experienced in a most alarming manner by two officers at Dinapore, who went down the river to shoot. One morning, as they were rising in quest of game, they heard a violent uproar, and found a savage rhinoceros goring their horses, which, being fastened by both their heads and heels, were unable either to flee or to resist. The servants concealed themselves in the jungle; the officers had scarcely time to climb into a tree before the ferocious beast, having destroyed the horses, tried to get at them. After making some attempts to dislodge them by tearing the tree with his powerful horn, and keeping them for a long time in suspense, he retreated at the rising of the sun.



THE PNEUMATIC DESPATCH.

UNDOUBTEDLY, the pneumatic despatch service is a very interesting and ingenious system of leaden tubes with iron casings, along which written messages—the actual papers on which messages are written, that is to say—are blown from point to point by compressed air, or are sucked along by the creation of a vacuum in front of them. This curious system of underground railways comprises some twenty miles of pipes, radiating from the instrument galleries to eighteen or twenty important telegraph stations in London, besides affording a ready means of transmission between different parts of the building below.

By way of an illustration of its working, suppose a telegram is handed in at the public office on the ground floor here for transmission to Birmingham. It is at once folded up, tucked into “a carrier”—a small gutta-percha case covered with felt—and by a simple piece of mechanism placed inside a tube about an inch and a half in diameter, running up to a central table in the galleries at the top of the house. At the same instant a telegraphic signal is sent to an attendant at the other end of the tube, who “puts on the vacuum,” that is to say, adjusts the apparatus so as to exhaust the air from the pipe, and up darts the carrier with its message, and the next moment comes with a thud into the end of the pipe hanging over the table in the middle of the room. It is, however, still some distance from that part of the room from which messages are transmitted to Birmingham, and if, as fast as telegrams were shot on to this table, messengers were sent to distribute them about, this floor would be the scene of a good deal of con-

fusion. To obviate this the tubes are again called into requisition. From this table in the centre—to which by means of the large engines all carriers are sucked by exhaustion, and from which they are all blown by compressed air—pneumatic pipes extend in various directions underneath the floor. Our carrier is promptly taken out of one tube and popped into another, gives one dive under the flooring of the room and emerges near the instrument by which its burden will be telegraphed to Birmingham. The outside tubes are somewhat larger than those inside the building, having a diameter of from two and a quarter to three inches. In London the longest existing tube is that between St. Martin's-le-Grand and Charing Cross, a distance of just about a mile and a half, and which the carriers traverse in four minutes.

One great advantage in the employment of these curious telegraph messengers is that they are all but absolutely reliable. There is no loitering on the way, no losing of messages. It does happen occasionally, however, on some systems, that a carrier sticks fast in the pipe. This is a very troublesome matter when it does occur. It involves the opening of the pipe, and, what is far more difficult, the previous determination of the precise spot where the delinquent is fixed.

Several methods of doing this have been devised. One is especially ingenious. A delicate elastic skin is stretched over the end of the tube in which the stoppage has occurred in such a manner that any motion of the air within the tube will cause a slight vibration of the skin at the end of it. A pistol is now fired near this delicate membrane, and the explosion causes a great wave of air to roll along inside the tube until it strikes the defaulting carrier, is reflected back, and produces a tremulous motion in the skin. Now it is very clearly established that a sound—or a motion in

the air, which is the cause of sound—travels at the rate of 1,142 ft. in a second, so that by carefully noting the number of seconds clapsing between the report of the pistol and the return of the wave, the distance of the obstruction in the pipe is easily calculated. Thus, if the sound has

taken ten seconds to go and return, it must have taken five seconds in reaching the carrier, and in each of those five seconds it will have travelled 1,142 ft., or a total distance of 5,710 ft., and at that distance along the pipe the truant messenger will certainly be found

A BIG COUNTRY.



AFTER travelling by rail for two days and three nights without stopping, except for brief moments at refreshment stations, one begins to understand the self-satisfaction with which the American boasts of his "big country." A good idea of the vastness of the United States is given by Hepworth Dixon where he says, "In England we have no lines of sufficient length, no areas of sufficient width, to convey an idea of its size. Our longest line is that running from the Land's End to Berwick—a line which is some miles shorter than the distance from Washington to Lexington. Our broadest valley is that of the Thames, the whole of which would lie hidden from sight in a corner of the Sierra Madre. The State of Oregon is bigger than England; Texas would be larger than France if France had even the frontier of the German Rhine. If the United States were parted into equal lots, they would make fifty-two kingdoms as large as England, fourteen empires as large as France.

A steamboat can go ninety miles up the Thames, two hundred miles up the Seine, five hundred and fifty miles up the Rhine. In America the Thames would be a creek, the Seine a brook, the Rhine a local stream, soon lost in a mightier flood. The Mississippi is five times longer than the Rhine, the Missouri three times longer than the

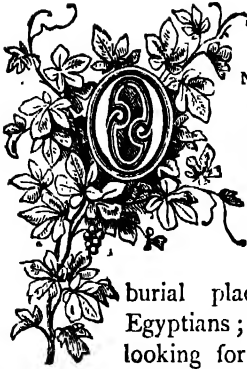
Danube, the Columbia is four times longer than the Scheldt. From the sea to Fort Snelling the Mississippi is ploughed by steamers a distance of 2,131 miles, yet she is but the second river in the United States.

So the lakes would be considered inland seas in Europe. Thus the Salt Lake, in Utah, has a surface of 2,000 square miles; Geneva has only 330. Yorkshire would disappear in Lake Erie."

Another writer says, "Few things impress one with the vastness of America more than the length of the river voyages, especially on the Mississippi and her tributaries. From New Orleans you have 200 miles of sailing up country, through the region of sugar-planting, before reaching the mouth of the Red River, and another 600 miles up the Red River to reach Lanesport, in Arkansas. From New Orleans up to the mouth of the Ohio you have 1,050 miles, and 1,000 more up the Ohio to Pittsburg, in Pennsylvania. On the Mississippi itself, the sail from New Orleans to St. Anthony, in Minnesota, is over 2,000 miles. Or if, after steaming 1,200 miles up the Mississippi, you turn off into the Red Missouri, the steamer takes you 1,500 miles farther before stopping at Fort Pierre. On the Missouri alone, from its point of junction with the Mississippi, you can sail 3,200 miles inland to Benton, being a sail by several hundreds of miles longer than from Great Britain to America."

The American has therefore some reason for his boast.

EGYPTIAN TOMBS.



IN the lofty mountains overlooking the richest valley of the Nile, and protecting it from the Libyan desert, is a long range of tombs, the burial place of the ancient Egyptians; and the traveller, looking for a moment at the little Mahommedan burying ground, turns with wonder from the little city he has left, and asks, "Where is the great city which had its graves in the sides of yonder mountains? Where are the people who devised for themselves tombs in the eternal granite?"

"The mountain is about as far from the city as the river, and the approach to it is by another strong causeway over the same beautiful plain. Leaving our donkeys at its foot, and following the nimble footsteps of my little Arab girl, we climbed by a steep ascent to the first range of tombs. They were the first I had seen, and are little visited by travellers; and though I afterwards saw all that were in Egypt, I still considered these well worth a visit. Of the first we entered, the entrance chamber was perhaps forty feet square, and adjoining it in the same range were five or six others, of which the entrance chamber had about the same dimensions. The ceilings were covered with paintings, finished with exquisite taste and delicacy, and in some places fresh as if just executed; and on the walls were hieroglyphics enough to fill volumes. Behind the principal chamber were five or six others nearly as large, with smaller ones on each side, and running backwards perhaps an hundred and fifty feet. The back chambers were so dark, and their atmosphere was so unwholesome, that it was unpleasant, and perhaps unsafe, to explore them; if we went in far, there was a loud rushing noise,

and, as Paul suggested, their innermost recesses might now be the abode of wild beasts.

But wishing to see what caused the noise, and at the same time to keep out of harm's way, we stationed ourselves near the back-door of the entrance chamber, and I fired my gun within; a stream of fire lighted up the darkness of the sepulchral chamber, and the report went grumbling and roaring into the innermost recesses, rousing their occupants to frenzy. There was a noise like the rushing of a strong wind; the light was dashed from Paul's hand; a soft skinny substance struck against my face; and thousands of bats, wild with fright, came whizzing forth from every part of the tomb to the only avenue of escape. We threw ourselves down and allowed the ugly frightened beasts to pass over us, and then hurried out ourselves. For a moment I felt giddy; the beastly creatures, driven to the light of day, were dazzled by the glorious sun, and flying and whirling blindly about, were dashing about against the rocky side of the mountain, and at length falling dead at its base.

Cured of all wish to explore very deeply, but at the same time relieved from all fears, we continued going from tomb to tomb looking at the pictures on the walls, endeavouring to make out the details, admiring the beauty and freshness of the colours, and speculating upon the mysterious hieroglyphics which mocked our feeble knowledge. We were in one of the last, when we were startled by a noise different from any we had yet heard, and from the door leading to the dark recesses within, foaming, roaring, and gnashing of teeth, out ran an enormous wolf; close upon his heels in hot pursuit came another, and growling fearfully, rolled over; again the first broke loose and fled; another chase along the side of the mountain, another grapple, a fierce and

desperate struggle, and then they rolled over the side, and we lost sight of them.

While walking along the edge of the mountain, in spite of bats and beasts, still taking another and another look, my ears were suddenly struck with a loud voice of lamentation coming from the valley below; and looking in the direction of the city, I saw approaching a long funeral procession, and the voice came from the mourners following the corpse. They were evidently coming to the Mahommedan burying-ground at the foot of the mountain, and I immediately left the tombs of the ancient Egyptians to see the burial of one who but yesterday was a dweller in the land.

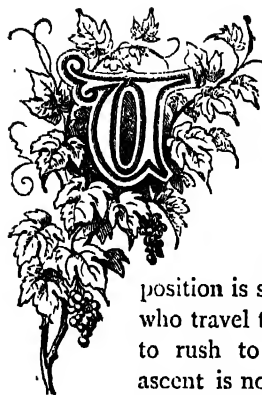
It approached with funeral banners and devices which I could not make out, but probably containing some precepts of the Koran. First in the strange procession came the beggars, or santons, men who are supposed to lead peculiarly pure and holy lives. Their beards were long, white, grizzly over their shoulders and breasts; they wore a scanty covering of rags, fastened together with strings, and all with some regard to propriety. Over their shoulders were slung, by ropes, large jars of water, which for charity's sweet sake, and for the love of the soul of the deceased, they carried to be distributed gratis at his grave. After them came a parcel of boys; then the sheiks and two officers of the town; then the corpse, tightly wrapped from head to foot in a red sash on a bier; then a procession of men, and more than one hundred women in long cotton dresses covering their heads and drawn over their faces, so as to hide all except their eyes.

Their tomb was square, with a round top, built of Nile mud and whitewashed; two men were engaged in opening it, which was done simply by pulling away a few stones, and scooping out the sand with their hands. In front, but a few feet from

the door, sat the old mother, so old as to be hardly conscious of what was passing around her, and probably long before this buried in the same grave; near her was the widow of the deceased, dressed in silk, and sitting on the bare earth with an air of total abandonment; her hands, her breast, the top of her head and her face plastered with thick coats of mud, and her eyes fixed upon the door of the tomb. A few stones remained to be moved away, and the door, or rather the hole, was opened; the two men crawled in, remained for a minute or two, came out and went for the corpse. The poor widow followed them with her eyes, and when they returned with the body, carefully and slowly dragged it within the tomb, and the feet and the body had disappeared, and the beloved head was about to be shut for ever from her eyes, she sprang up wildly, and passionately throwing her arms toward the tomb, broke forth in a perfect frenzy of grief:—

‘Twenty years we have lived together; we have always lived happily; you loved me, you were kind to me, you gave me bread. What shall I do now? I will never marry again. Every day I will come and weep at your tomb, my love, my life, my soul, my heart, my eyes! Remember me to my father, remember me to my brother,’ etc., etc. I do not remember half she said, but as Paul translated it to me, it seemed the very soul of pathos; and all the time she was walking distractedly before the door of the tomb, wringing her hands, and again and again plastering her face and breast with mud. The mourning women occasionally joined in chorus, santons ostentatiously crying out, ‘Water, for the love of God and Prophet, and the soul of the deceased;’ and a little girl, about seven or eight years old, was standing on the top of the tomb, naked as she was born, eating a piece of sugar-cane.”

A RAILWAY UP A MOUNTAIN.



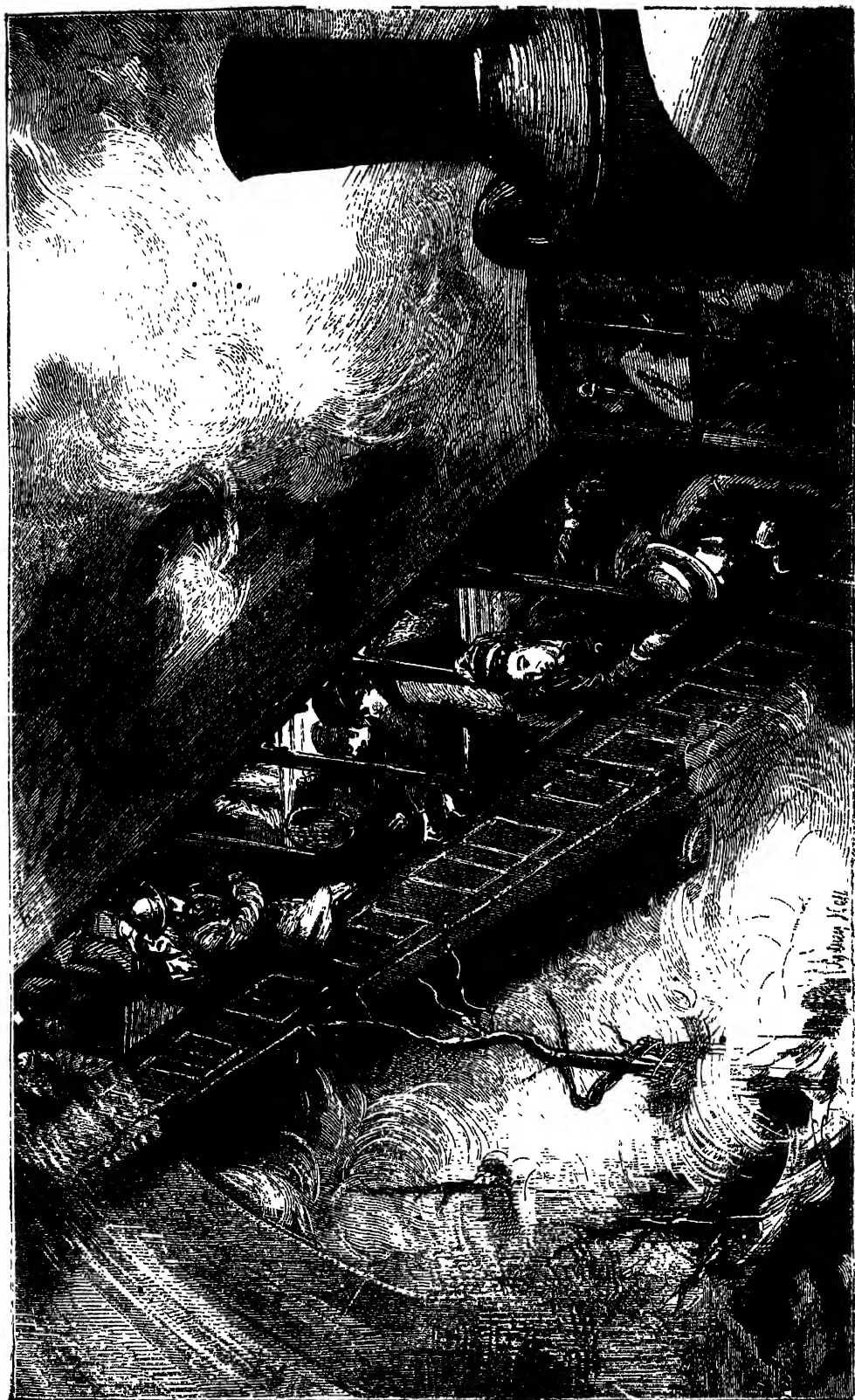
UPON the bank of the Lake of Lucerne, stands the Righi Mountain, one of the most picturesque objects in Switzerland. Its position is so attractive that all who travel thither feel tempted to rush to the summit. Its ascent is not, however, so easy as it looks; and, to facilitate the upward journey of the numerous visitors, a railway has been constructed. It is of course only worked during the summer months, and is exposed to serious risk of damage or even destruction in the early spring from the melting snow, the rush of swollen torrents, and masses of falling rocks which come thundering down with resistless force.

The terminus of the line is at Vitznau, a few yards from the landing stage of the steamers. At the rear are a turn-table and large shed for the engines and carriages. The engine when on the level turn-table looks like a huge iron bottle standing on a low platform, which carries cylinders, cranks, and other locomotive gear, and is much lower at one end than the other. This difference of height imparts an awkwardness of appearance; and the huge bottle, which is, in fact, the boiler and chimney, leans to one side, as if about to fall; but this is planned, and with a purpose, as you will see when the locomotive begins to mount the slope. Then its floor becomes level, and the bottle stands upright. In front of the boiler is a railed space, in which luggage is carried. The driver and stoker stand, as usual, in the rear; and the fuel is coal.

The passenger carriages are ten feet wide, and resemble the tramway cars recently introduced in London, and are not, as has been stated, of two storeys. The seats, nine in number, are placed trans-

versely; and when all are filled the carriage contains fifty-four passengers, who find their comfort cared for in the convenient shape of the seats. These carriages and the locomotives were built at Olten, a busy centre of industry. The railway gauge is five feet. The sleepers are longitudinal and continuous, as on the Great Western line. Midway between the rails lies what may be described as a heavy iron ladder, with thick steps, slightly bevelled, from below upwards. Up this ladder the locomotive walks, by means of a thick, cogged wheel, fitted beneath its floor.

There are no trains, unless a single carriage and a locomotive can be named a train. The carriage is pushed up the hill, not pulled. The passengers sit with their faces to the engine, whereby they have the view of the slopes beneath them, of the lake, and of the opposite hills, during the ascent. Timid folk should sit in the middle of a seat, so as to avoid the sight of the gulfs and precipices over which the railway passes. The right-hand side (as you look towards the engine) is the best for those who wish to enjoy the prospect. The pace is about double as fast as ordinary walking. As soon as a carriage starts, a man—a way watcher—walks ahead to clear away obstructions that may have fallen from the upper slopes, and especially to pick out stones from beneath the steps of the ladder. Travellers who have seen the Righi know that it is a mass of pudding, so to speak, with millions of stones for plums. Hence constant watchfulness is necessary, for a stone in the wrong place would keep out the cog. There are relays of way-watchers, each being responsible for a section of the line; and, as a precaution against accidents, each carriage is fitted with an efficient brake. The line stretches in one continuous slope up the mountain, with but slight departures from a straight line. There are no zigzags. Half-way up the locomotive stops at a siding



to take in water, an operation which requires about ten minutes. The view becomes more and more interesting with increasing height, and the fresh mountain temperature is felt. Here and there the footpath from Vitznau makes a slant towards the railway, and tourists are seen going up and down at what seems a slow pace. The sight of them reminds one (says a writer) of Hawthorne's Celestial Railway and the pilgrims who went plodding in the old-fashioned way.

In the descent the locomotive precedes a carriage, and, by means of its cogs, maintains always the same steady pace. The entire length of the railway is 17,500 Swiss feet, worked by compactly-built engines of 120 horse-power.

Much more enjoyable, if more fatiguing, was the old mode of ascent, on foot or horseback, winding through pine forests, or amongst masses of the *Nagelfluë*, of which the mountain is composed.



THE BAKED MONKS OF MALTA.

NO little interest attaches to the Monastery of the Capuchins, vulgarly known to visitors in Malta as "the place of the baked monks," from the mode of disposal of the dead members of the brotherhood. Instead of being committed to the earth, their bodies are first subjected to great heat in an oven, and then the desiccated bodies, attired in their usual garb, are set up in niches in the walls of the carneria, or charnel-house of the convent, with inscriptions over their heads, setting forth their titles, names, and ages. The building itself is poor and mean, and contains nothing remarkable except a few pictures, representing saintly miracles. Quickly exhausting these, we prepared to inspect the "sight" of the place.

"Under the guidance of a very dirty barefooted monk, dressed in coarse brown serge, with a rope tied round his waist as a girdle, we descended a flight of steps into an extensive vault, containing that which would, I imagine, satisfy any amount of craving for the horrible. Here all the monks who had died in the convent, for many years past, were to be seen, dressed in their frocks and hoods, ranged along the

walls in all stages of decay. The bones of those whose bodies were too far advanced in decomposition to allow of their standing in their allotted spaces were nailed upon the walls in regular order, so as to form a kind of decoration, the skulls being placed in rows along the ceiling. A short look at this curious but disgusting spectacle was sufficient, and we speedily returned to the livelier regions above." Since this visit the practice has been discontinued, under the orders of Government, and the mode of burial customary in a Christian community enjoined.

Malia is not the only place where such a sight may be seen. In the catacombs at Kieff, in Russia, the bodies of the monks are laid in rows, in open coffins, clothed in their best apparel, and adorned with gold and jewels.

At Syracuse and Palermo, also, a somewhat similar practice prevails. The bodies of the monks are dried, and laid in open coffins, or fixed in niches of the walls, with their names on their breasts. At the convent on Mount Sinai is a vault, where the bodies of the dead monks repose on an iron frame until only the dry parts remain, when they are taken to a charnel house, and added to a collection of some 30,000 skeletons which are there exhibited to the visitor.



SCIENCE ON THE SEAS.

VOYAGE round the world has always had an attraction for British youth. Who amongst us in his early days has not read with breathless interest the account of Anson's "Voyages," or followed Captain Cook in that famous circumnavigation which has immortalised his name? It was for a voyage such as this and for purely scientific objects that the *Challenger* was fitted out, at the instance of the Royal Society.

Captain G. S. Nares was selected to command the expedition, and, besides the usual staff of naval officers, Professor Wyville Thomson, F.R.S., as scientific director, three naturalists, a chemist and physicist, and an artist and secretary, were attached to the vessel. The hydrographic and magnetic work was undertaken by the naval officers, and the natural history department was placed in the able hands of the scientific staff.

Four days before the Christmas of 1872 the *Challenger* sailed from our shores; and her researches during the next year were confined to the Atlantic, four complete sections having been taken across it. The result of the deep-sea dredging was most satisfactory; some specimens were new, and others of great rarity. The vexed question was settled as to whether life existed below certain depths, and much valuable information was obtained relative to the great oceanic currents. The deepest water found was off the Virgin Islands, in the West Indies, where bottom was obtained at 3,875 fathoms. This depth has only been exceeded once—i.e., in the North Pacific Ocean, latitude 11° 24' N., longitude 143° 16' E., where a sounding was made in 4,500 fathoms. In all probability this depth of water will never be much exceeded. Those remarkably deep soundings taken by former

navigators are undoubtedly entirely erroneous. In many places the *Challenger* proved that they were so by bringing up a portion of the bottom from less depths; and in some, where the time interval was carefully taken and published, with our present knowledge on the subject, the correct depth can be nearly approximated.

During the year 1873, North and South America, the West Indies, Western Islands, Madeira, Canary, and Cape Verd Islands, and Africa, were visited, and 19,300 miles sailed over. After a refit at the Cape of Good Hope, the *Challenger* sailed for the South Seas, in December, 1873. Marion Island and the Crozets were visited, the latter since brought into notoriety by the loss of the *Strathmore*; as with that unfortunate vessel, gales of wind and thick fogs were experienced by the *Challenger*. The Island of Kerguelen had been fixed on as an observatory station for the transit of Venus, which occurred in 1874, and, as it was desirable that it should be explored in order to settle the site of an observatory, the *Challenger* was entrusted with that duty. A month was taken in completing it, during which the eastern side of the island was surveyed and a site recommended, which was afterwards adopted. The western shores were altogether out of the question, on account of the mists accumulated by the prevailing westerly winds. Heard Island, to the south of Kerguelen, was next touched at. It is quite barren, and consists of one immense glacier. A party of American whalers are stationed there, engaged in sea-elephant fishing, which is very productive. It would be difficult to imagine a more dreary life than those whalers lead; they are relieved and the produce of the fishery is taken away every year.

The *Challenger* then sailed south until the Antarctic Circle was crossed, and she reached within 1,400 miles of the South

Pole. Open pack ice was entered, and great numbers of icebergs were seen, as many as 80 being counted at one time from the masthead. Some were 300 ft. high, and between two and three miles long. They were nearly all flat or table-topped, only the calves or small bergs presenting the curious appearance of Arctic bergs. The Antarctic continent of the American explorer Wilks (whose name, perhaps, will be best remembered in connection with the *Trent* affair) was sought for in vain. It was reported to have been seen by him when in command of the discovery ship *Vincennes* in 1834. As 1,300 fathoms of water were found on the supposed site, it was concluded that, if it ever existed, it has now sunk. Gales of wind, accompanied by driving snowstorms, render navigation in these seas neither safe nor pleasant, and the seamanship of the officers was severely tried in keeping clear of the numerous icebergs, to strike one of which would be destruction. The sea was full of life; innumerable whales spouted round the ship, and several kinds of penguins were seen. The water was also rich in surface crustacea.

Melbourne was reached on St. Patrick's Day, 1874, and the next three months were most agreeably spent in the Australian colonies. A line of soundings was next run to New Zealand, preparatory to a telegraph cable being laid; and afterwards, the Friendly Islands, Fiji, New Hebrides, Arrou, and Ki Islands, were touched at, the natives being all found tolerably friendly. The Moluccas, or Spice Islands, were next visited, and expeditions made to the nutmeg, cinnamon, pepper, and cocoa plantations. Nothing can exceed the beauty of these islands, or the admirable manner in which the plantations are conducted. At Manilla, in the Philippine Islands, they had an opportunity of seeing the enormous cigar factories, in some of which 10,000 girls are employed. Then the ship proceeded to China.

At Hong-kong, to the great regret of all, Captain Nares was called away, he having been selected to command the Arctic Expedition; but his successor, Captain

Thomson, in a short time rendered himself equally popular.

In the early part of 1875 a good deal of old ground was again sailed over in the Sulu and Celebes Seas. A short time was spent at Cebu, one of the Philippine group, dredging for the beautiful Euplectella sponge, better known by its popular name of Venus's Flower-basket, and which is now not uncommon in our museums; numerous fine specimens were obtained. On the adjoining island of Mactan the great explorer Magellan was killed in an engagement with the natives in 1521. A cross, said to have been erected by him at Cebu, is pointed out with reverence by the Spaniards.

The *Challenger* next sailed to the north-eastern shores of New Guinea, and touched at Humboldt Bay, where the savages were found in all their native and naked grandeur. They were armed with spears and bows and arrows, and objected to exploring parties landing, standing with their arrows drawn to the head. They appeared to have no idea of the power of firearms, and there was no inclination to teach them the lesson. Notwithstanding the hostile attitude assumed when an attempt was made to land, they readily bartered their spears, bows, stone axes, ornaments, etc., alongside the ship for hoop-iron and beads. The natives are a fine race, although many were covered with some skin disease. The men wear boars' tusks thrust through their nostrils, which give them a ferocious appearance. Not one could be prevailed on to come on board, even by liberal offers of axes and nails, which would lead to the supposition that they had been visited by kidnappers. At Admiralty Island the natives were more friendly, and freely allowed parties to land. They were armed with obsidian-headed spears.

The *Challenger* then sailed for Japan, and on the passage obtained the deepest sounding, which has already been referred to. Two months were spent on the coasts of Japan and in the inland seas, and then the ship sailed for the Sandwich Islands, Society Islands, Juan Fernandez, and Valparaiso.

Juan Fernandez was found inhabited by some Chilians engaged in the seal-fishery. A goat, descended from Selkirk's pets, was here taken on board, and was called Crusoe. After leaving Valparaiso, the passages leading to the Straits of Magellan were entered at Cape Tres Montes, and the ship emerged into the Atlantic at Cape Virgins, the scenery being magnificent, particularly the fine glaciers, some of which extended to the water's edge. The Falkland Islands, Monte Video, Ascension, St. Vincent, and Vigo were visited on the passage home, and

further researches were made in the depths of the Atlantic by continued dredging, trawling, and sounding.

The equator was crossed six times, and the 180th meridian of longitude five times. The total distance run was 68,500 miles; the coal expended amounted to 4,700 tons. The ship was 713 days at sea, and 568 in harbour. Two hundred and forty-three men left England in the *Challenger*, of whom 144 returned in her, 61 deserted, 10 died, and 5 went with their old commander in the Arctic Expedition.

THE STREET OF EVERLASTING PROSPERITY

LET us take a walk down "the Street of Everlasting Prosperity," the Regent Street of the north suburb of Tien-tsin. At its entrance is a crowd of Chinamen, which, constantly renewed from dawn to sunset, stand gapping through a door in the gateway at the horses picketed in a large court-yard. Pushing our way through these unsavoury Celestials, we find ourselves in a small square, occupied by the "eel-pie" and "baked potato" men of the place. Your working man dines in the street, and this square is a favourite *al fresco* restaurant. Li, on our right, deals in meat pies. He has a small charcoal fire below his oven, and in a trice his *pâté* is compounded and cooked before the public. Ho, by his side, supplies vegetable diet, turnips, onions, pumpkins, yams, cut into small slices and served in the water wherein they are boiled. Here is a man with sweetstuff, pastry, and "tuck." There, another with fruit—grapes, peaches, lotus fruit, water-melons, apples, and pears. All tastes are supplied.

But even in dining the ineradicable love of the Chinaman for gambling is evinced.

Every one of these dealers has a box like a dice box, in which twenty small sticks are placed. Two of these sticks are prizes, the remainder blanks. Each portion of food is supposed to be worth ten cash, and on staking one cash every comer may try his luck. From morning to night is the rattle of these sticks to be heard in the square as the dealers invite their customers. From morning to night may the Chinaman be seen yielding to the invitation. Here is an old fellow, a "bargee" on the river. He has but two cash, which he stakes, and loses one after the other. His face is rueful, and his belly empty, so we give him ten cash, with which he may insure the meal he covets. He takes the cash, but, instead of buying his food, he recommences to gamble for it. One cash after another is drawn from him, and when he loses his last he walks away dinnerless. The fishmonger is perambulating about. His fish, in a shallow round wooden bowl, lie gasping in three or four inches of water. Here are eels, brown and silver, large fat muddy carp, soles, and a fish speckled like a trout and of much the same flavour. At an open cook-shop Chinese *artistes* are preparing the dinner of the day.



CHINESE STREET TOY-SELLER.

The favourite dish is a stew composed of chopped pork, onions, seaweed, shrimps, and eggs. We taste, but its flavour is by no means agreeable to the Western palate.

And now, in a quiet secluded nook, is a good-humoured laughing crowd, enjoying the feats of a juggler. A wonderful man! He takes two pieces of sharp wire, a couple of feet long, inserts them in his nostrils, and passes them thence down his throat. There is no deception, for he opens his mouth wide, and we see the wires down his gullet. Then he takes two leaden bullets, one the size of an ordinary musket ball, the other weighing twelve ounces. He swallows the little one first. With many contortions he brings them up again, and the small bullet is the first to reappear. He draws the wire back through his nose, and spits blood. A shower of cash rewards his feat. Then he swallows a sword, crams pointed sticks into his ears and eyes, and performs a variety of tricks too numerous to be detailed.

We next enter a perfumer's shop, full of knick-knacks and necessities for my lady's toilet. Pearl powder is made up in neat little packages, and with rouge and paints of various hues. Lotions for the complexion, perfumes, dyes for the hair, and here, in a corner, "thine incomparable oil, Macassar." A barber is plying his trade. He shaves the head, combs and plaits the tail, and extracts wax from the ears, the latter operation is evidently a favourite with the Celestials! Alas! false tails are common here, as they are said to be in England. The shop is full of them, at a dollar the half-dozen. A distinguished officer of irregulars bought a few to make a plume for his helmet. A "curio" stall contains very ordinary china at very exorbitant prices. Among its prizes are a common English bottle, price half a dollar and an English earthenware plate, with "Swiss scenes" painted thereon, for which double that amount is demanded. Here, also, are small boxes labelled "Superior congreve matches, without smell or sulphur." They would cost a halfpenny at home; their price at Tien-tsin is $2\frac{1}{2}d$.

The crowd at our heels laugh as we enter a pawnbroker's shop. It is full of depositors, old clothes being the principal articles in pledge. We ask the head man to see the establishment. He would be delighted, but it is against rule. He deeply regrets that he must refuse our Majesties, but his orders are explicit. After a little pressing he yields, and we are conducted through one court after another, the building containing all that man can imagine, from pocket-handkerchiefs to junks' anchors. The goods may be pledged for thirty moons (two years and a half), when they are sold, if unredeemed. The rate of interest is 12 per cent. per annum. Here is a large ice-house, very long, very deep, very well drained. The ice is in blocks full two feet thick, and gives abundant evidence of a severe winter in this district. Returning home, we enter a tea-shop. The "cheering" beverage is contained in a large brass kettle, a brass butterfly with extended wings on its spout. We drink, are refreshed, and bid adieu to "the Street of Everlasting Prosperity."

Coming back, we had more music. To our Western ears the concert was far from harmonious. A European who had resided in China for years, and who had been present at reviews, marriages, and funerals, declared to us that he had never been able to make out a single air. There was the loud gong, large and small drums, cymbals, pipes, various flutes, trumpets like those made for children; horns, which are instruments with many pipes; a guitar with one or two strings, and a variety of others, amongst which are bells, hung up in a frame, in order to give an harmonious chime. The principle on which a concert is played appears to be which of the musicians shall outdo the other in loudness of sound, in which attempt the beater of the gong generally succeeds to admiration.

One of the most conspicuous of street traders is the pedlar. The Chinese pedlar differs very materially from the European worthy of the same profession. He is for the most part a man steeped in poverty,

who, by the recommendation of a tolerable character for honesty, has been able to borrow a little capital for the purposes of trade. He had need be industrious and self-denying to get on, for there are a good many hindrances in his path. In the first place, he pays an exorbitant interest for the use of his capital, the law authorising usury at thirty per cent.; and in the next place, whenever he enters a new district to trade, he has first to mollify the chief man of the place by the present of lanterns, silk purses, fans, or other desirable articles of the sort; failing in which the said chief would infallibly chase him ignominiously from the district, even if he did not take him into custody and treat him to a welting with the bamboo for failing in respect to his superiors—such failure being an offence punishable by law in China.

The pedlar generally travels with a large assortment of merchandise, and he exercises considerable ingenuity in displaying it to the public. His plan is to build himself up, as it were, in a kind of framework of bamboo, upon the rails and cross-bars of which he hangs out his goods for sale. These are cloths of all colours, silks, cottons, garters, tobacco purses, pipe bowls, and mouth-pieces, cords, yarns, bobbins, twine, etc.

Thus surrounded with the ensigns and materials of his commerce, and packed almost like a grub in his cocoon, he marches leisurely from place to place, lifting up his voice as he goes, and giving utterance to a sequence of guttural sounds, the English of which is not, you may be sure, "Stinking fish!" The sound of his voice is well known, and his arrival in an inland village is a signal to the inhabitants to rummage up their coppers, and transmute them into the indispensable wares of which he is the periodical provider.

Another peripatetic dealer frequently met with is the pipe merchant. The man who deals in pipes cannot fail to be a person of importance in the immense empire of China. The fifteen Chinese provinces and the half-savage regions of Tartary number almost as

many smokers as inhabitants. The men of all ranks and all ages, the women, the children of both sexes, everybody, in short, bear about on the person the apparatus necessary to the enjoyment of the savoury fumes of tobacco. Whatever may be their daily occupations—whether they traverse the streets on business, sit at home for repose, or promenade the public places for pleasure—the Chinese people are never without their pipes; and during the progress of the English embassies, nothing more astonished the visitors than to see children of ten years of age, and even younger, running before the cortege with pipes in their mouths. When the Chinese is not using his pipe, it rests in a species of reticule suspended at his girdle. Another indispensable accessory consists in a little purse of satin, attached by a ribbon to the middle of the tube of the pipe. These little bags are generally divided into several compartments; besides the tobacco, they contain opium, areca nuts, and other masticatory delicacies. The tube of the Chinese pipe is made of a species of bamboo, generally black; the bowl and the mouth-piece are of pe-tong (white Japanese copper) or of porcelain: they will take on or off at pleasure. These pipes are unique in their structure, and resemble in no respects the pipes found among other nations. It was supposed for a long time that the Chinese imported the tobacco plant as well as the practice of smoking it from the Americans; that, however, is not the fact. The naturalist who accompanied the first English embassy ascertained that the plant which the Chinese smoke, and of which they consume prodigious quantities, is a different variety from either of the three species discovered in America, and hence he declared his opinion that the custom of smoking tobacco has existed in China from time immemorial. The traditions of the Chinese bear out this opinion.

But we have not space to describe the many things that strike the observant foreigner as he walks through the streets of a Chinese city.

DU CHAILLU AND THE GORILLAS.



LOOKING once more to our guns, we started off. I confess that I never was more excited in my life. For years I had heard of the terrible roar of the gorilla, of its vast strength, its fierce courage, if, unhappily, only wounded by a shot. I knew that we were about to pit ourselves against an animal

which even the leopard of these mountains fears, and which, perhaps, has driven the lion out of this territory; for the king of beasts, so numerous elsewhere in Africa, is never met in the land of the gorilla. Thus it was with no little emotion that I now turned again toward the prize at which I had been hoping for years to get a shot.

We descended a hill, crossed a stream on a fallen log, and presently approached some huge boulders of granite. Alongside of this granite block lay an immense dead tree, and about this we saw many evidences of the very recent presence of the gorillas.

Our approach was very cautious. We were divided into two parties; Makinda led one, and I the other. We were to surround the granite block behind which Makinda supposed the gorilla to be hiding. Guns cocked and in hand, we advanced through the dense wood, which cast a gloom even in midday over the whole of the scene.

I looked at my men, and saw plainly that they were in even greater excitement

than myself. Slowly we pressed on through the dense brush, fearing almost to breathe, lest we should alarm the beasts. Makinda was to go to the right of the rock, while I took the left. Unfortunately, he circled it at too great a distance. The watchful animals saw him. Suddenly I was startled by a strange, discordant, half-human, devilish cry, and beheld four young gorillas running toward the deep forests. We fired, but hit nothing. Then we rushed on in pursuit; but they knew the woods better



than we. Once I caught a glimpse of one of the animals again, but an intervening tree spoiled my mark, and I did not fire

We ran till we were exhausted, but in vain. The alert beasts made good their escape. When we could pursue no more, we returned slowly to our camp, where the women were anxiously expecting us.

I protest I felt almost like a murderer when I saw the gorillas this first time. As they ran—on their hind legs—they looked fearfully like hairy men; their heads down, their bodies inclined forward, their whole appearance like men running for their lives. Take with this their awful cry, which, fierce and animal as it is, has yet something human in its discordance, and you will cease to wonder that the natives have the wildest superstitions about these “wild men of the woods.”

We saw several gorilla tracks, and about noon divided our party, in the hope of surrounding the resting-place of one whose tracks were very plain. I had scarce got away from my party three hundred yards when I heard the report of a gun, then of three more, going off one after the other. Of course I ran back as fast as I could, and hoped to see a dead animal before me, but was once more disappointed. My Mbondemo fellows had fired at a female, had wounded her, as I saw by the clots of blood which marked her track, but she had made good her escape. We set out at once in pursuit; but these woods are so thick, so almost impenetrable, that pursuit of a wounded animal is not often successful. A man can only creep where the beast would run.

Night came upon us while we were still beating the bush, and it was determined to camp out and try our luck again on the morrow. Of course, I was only too glad. We shot some monkeys and birds, built our camp, and, while the men roasted their monkey-meat over the coals, I held my birds before the blaze on a stick. Fortunately we had food enough, and of a good kind, for next day.

We started early, and pushed for the most dense and impenetrable part of the forest, in hopes to find the very home of the beast I so much wished to shoot. Hour

after hour we travelled, and yet no signs of gorilla—only the everlasting little chattering monkeys, and not many of these, and occasionally birds. In fact, the forests of this part of Africa, as the reader has seen by this time, are not so full of life as in some other parts to the south.

Suddenly Miengai uttered a little *cluck* with his tongue, which is the native's way of showing that something is stirring, and that a sharp look-out is necessary; and presently I noticed, ahead of us seemingly, a noise as of some one breaking down branches or twigs of trees.

This was the gorilla, I knew at once, by the eager and satisfied looks of the men. They looked once more carefully at their guns, to see if by any chance the powder had fallen out of the pans; I also examined mine, to make sure that all was right; and then we marched on cautiously.

The singular noise of the breaking of tree-branches continued. We walked with the greatest care, making no noise at all. The countenances of the men showed that they thought themselves engaged in a very serious undertaking; but we pushed on, until finally we thought we saw through the thick woods the moving of the branches and small trees, which the great beast was tearing down, probably to get from them the berries and fruits he lives on.

* Suddenly, as we were yet creeping along in a silence which made a heavy breath seem loud and distinct, the woods were at once filled with the tremendous barking roar of the gorilla.

Then the underbrush swayed rapidly just ahead, and presently before us stood an immense male gorilla. He had gone through the jungle on his all-fours; but when he saw our party, he erected himself and looked us boldly in the face. He stood about a dozen yards from us, and was a sight I think I shall never forget. Nearly six feet high (he proved four inches shorter), with immense body, huge chest, and great muscular arms, with fiercely-glaring, large, deep, grey eyes, and a hellish expression of face, which seemed to me like some nightmare vision;

thus stood before us this king of the African forest.

He was not afraid of us. He stood there and beat his breast with his huge fists till it resounded like an immense bass-drum, which is his mode of offering defiance; meantime giving vent to roar after roar.

The roar of the gorilla is the most singular and awful noise heard in these African woods. He begins with a sharp *bark*, like an angry dog, then glides into a bass *roll*, which literally and closely resembles the roll of distant thunder along the sky, for which I have sometimes been tempted to take it where I did not see the animal. So deep is it that it seems to proceed less from the mouth and throat, than from the deep chest and vast paunch.

His eyes began to flash fiercer fire as we stood motionless on the defensive, and the crest of short hair which stands on his forehead began to twitch rapidly up and down, while his powerful fangs were shown as he again sent forth a thunderous roar. And now truly he reminded me of nothing but some hellish dream creature—a being of that hideous order, half-man, half-beast, which we find pictured by old artists in some representations of the infernal regions. He advanced a few steps, then stopped to utter that hideous roar again, advanced again, and finally stopped when at a distance of about six yards from us. And here, just as he began another of his roars, beating his breast in rage, we fired, and killed him.

With a groan which had something terribly human in it, and yet, was full of brutishness, he fell forward on his face. The body shook convulsively for a few minutes, the limbs moved about in a struggling way, and then all was quiet; death had done its work, and I had leisure to examine the huge body. It proved to be five feet eight inches high, and the muscular development of the arms and breast showed what immense strength it had possessed.

The gorilla chooses the darkest, gloomiest forests for its home, and is found on the edges of the clearings only when in search

of plantains, or sugar-cane, or pine-apple. Often they choose for their peculiar haunt a wood so dark that, even at midday, one can scarce see ten yards. This makes it the more necessary to wait till the monstrous beast approaches near before shooting, in order that the first shot may be fatal. It does not often let the hunter re-load.

Our little party separated, as is the custom, to stalk the wood in various directions. Gambo and I kept together. One brave fellow went off alone in a direction where he thought he could find a gorilla. The other three took another course. We had been about an hour separated when Gambo and I heard a gun fired but a little way from us, and presently another. We were already on our way to the spot, where we hoped to see a gorilla slain, when the forest began to resound with the most terrific roars. Gambo seized my arms in great agitation, and we hurried on, both filled with a dreadful and sickening alarm. We had not gone far when our worst fears were realized. The poor brave fellow who had gone off alone was lying on the ground in a pool of his own blood, and I thought at first, quite dead. His bowels were protruding through the lacerated abdomen. Beside him lay his gun. The stock was broken, and the barrel was bent and flattened. It bore plainly the marks of the gorilla's teeth. We picked him up, and I dressed his wounds as well as I could with rags torn from my clothes.

When I had given him a little brandy to drink, he came to himself, and was able, but with great difficulty, to speak. He said that he had met the gorilla suddenly and face to face, and that it had not attempted to escape. It was, he said, a huge male, and seemed very savage. It was in a very gloomy part of the wood, and the darkness, I suppose, made him miss. He said he took good aim, and fired when the beast was only about eight yards off. The ball merely wounded it in the side. It at once began beating its breast, and with the greatest rage advanced upon him.

To run away was impossible. He would have been caught in the jungle before he had gone a dozen steps. He stood his ground, and, as quickly as he could, re-loaded his gun. Just as he raised it to fire, the gorilla dashed it out of his hands, the gun going off in the fall; and then in an instant, and with a terrible roar, the animal gave him a tremendous blow with its immense open paw, frightfully lacerating the abdomen, and with this single blow laying bare part of the intestines. As he sank bleeding to the ground, the monster seized the gun, and the poor hunter thought he would have his brains dashed out with it. But the gorilla seemed to have looked upon this also as an enemy, and in his rage almost flattened the barrel between his strong jaws.

When we came upon the ground the gorilla was gone. This is their mode when attacked—to strike one or two blows, and then leave the victims of their rage on the ground and go off into the woods.

We hunted up our companions and carried our poor fellow to the camp, where all was instantly excitement and sorrow. They entreated me to give him medicine, but I had nothing to suit his case. I saw that his days were numbered.

I find that I do not get accustomed to the roar of the gorilla. Notwithstanding the numbers I have hunted and shot, it is still an awful sound to me. The long reverberations coming from his portentous chest; the vindictive bark with which each roar is begun; the hollow monotone of the first explosion; all are awe-inspiring, and proclaim this beast the monarch of these forests.

When the animal became aware of our approach, he at once came towards us, uttering a succession of the short bark-like yells which denote his rage, and which have a peculiarly horrible effect. They remind one only of the inarticulate ravings of a maniac.

Balancing his huge heavy body with his arms, the animal came towards us, every

few moments stopping to beat his breast and throwing his head back to utter his tremendous roar. His fierce gloomy eyes glared upon us; the short hair was rapidly agitated, and the wrinkled face seemed contorted with rage. He was like a very devil, and I do not wonder at the superstitious terror with which the natives regard him.

His manner of approach gave me once more an opportunity to see with how much difficulty he supports himself in the erect posture. His short and slender legs are not able firmly to sustain the vast body. They totter beneath the weight, and the walk is a sort of waddle, in which the long arms are used, in a clumsy way, to balance the body and keep up the ill-sustained equilibrium. Twice he sat down to roar, evidently not trusting himself to this exertion while standing.

My gun was fresh loaded, and could be depended upon, so I stood in advance. I waited, as the negro rule is, till the huge beast was within six yards of me; then, as he once more stopped to roar, delivered my fire, and brought him down on his face dead.

It proved to be a male, full-grown, but young. His huge canine tusks, his claw-like hands, the immense development of muscle on his arms and breast, his whole appearance, in fact, proclaimed a giant strength. There is enough likeness to humanity in this beast to make a dead one an awful sight even to accustomed eyes, as mine were by this time. I never quite felt that matter-of-course indifference, or that sensation of triumph which the hunter has when a good shot has brought him a head of his choice game. It was as though I had killed some monstrous creation, which yet had something of humanity in it. Well as I knew that this was an error, I could not help the feeling.

This animal was five feet eight inches high. In the evening Minsho brought in a young female he had shot, which measured three feet eight inches."



GLASS MANUFACTURE.

HAVING discovered coloured glass beads and amulets among the Druidical remains in various parts of this country, it has been supposed that the art of making glass was known in Britain before its invasion by the Romans. The probability is, that the ancient Britons procured these in traffic with the Tyrians, who visited the island to drive a trade with the savage inhabitants in toys and trinkets, giving glass beads and other articles in exchange for skins or other natural productions.

The use of glass for the purpose of glazing windows is of comparatively recent date. Artificers, skilled in the making of glass, were brought over from the Continent in the year 674, to glaze the windows of the church and monastery at Wearmouth, in Durham. For many centuries afterwards, however, the use of window glass was confined to sacred edifices and to the residences of the nobility. In a survey of Alnwick Castle, in 1567, it is recorded that the glass casements were taken down during the absence of the family, to preserve them from accident. A century after that time the use of window glass was so small in Scotland that only the upper rooms in the royal palaces were furnished with it, the lower part having wooden shutters to admit or exclude the air. The windows of private houses were filled with oiled paper, or sheets of linen, and wooden lattices were in common use till the beginning of the last century.

From an old contract still in existence, it appears that glass was made in London previous to the year 1439, but that it was of inferior quality. The finer sort of window glass was made at Crutched Friars, in London, in 1557. In the year 1635 workmen

were obtained from Venice, but many years passed before the English manufactories equalled the Venetian and French in the quality of these articles. The first flint-glass made in England was manufactured at the Savoy House, in the Strand, and the first plate-glass for looking-glasses, etc., was made at Lambeth, by Venetian workmen, brought over in 1670 by the Duke of Buckingham. To encourage the manufacture, the Government granted a bounty upon all glass exported, and from this time the English glass manufactories became successful rivals of the Venetian and French. There are now probably more than 20,000 men and boys employed in this manufacture, and glass made in England is sent to almost every part of the world. The price, too, is very much cheaper than it used to be, for a crate of crown-glass, which in former times cost £12, could be bought a year or two ago for a little over £2; and a foot of common sheet-glass, the price of which was fourteen pence in 1848, was twopence in 1868.

The method of blowing, moulding, and grinding, are as follows: A workman takes a hollow iron tube, four or five feet long, with which he stirs round the molten glass, and takes up as much of the metal as he requires. He then blows through the tube to hollow out the glass, until it is large enough and thin enough for his purpose. It is then rolled on a flat stone in order to make it smooth and round, being sometimes held for a short time to the mouth of the furnace to soften the glass, should it become hard from getting cool before it is properly shaped. Then another workman takes the article which has been made, and trims the mouth or edges of the bottle or globe, such as we use for lamps and for gas chandeliers. Then with a long rod he takes the globes, as they are made, to an oven, in which they will be slowly cooled, by being put in at the

hot end and slowly pushed through to the cooler end, until they come out into the air. This, called "annealing," is a very necessary part of the business, as the glass would break directly if it were allowed to get cold all at once.

Glass-casting, by which sheet and plate-glass are made, was discovered by a curious accident. A man was melting some glass

in a large pot, when it fell down, and the liquid glass ran along the pavement. As he did not like to lose his glass, he took up the stones, when he found the glass in a sheet much smoother than could be made by blowing.

Soon afterwards great flat tables were made, on which melted glass was poured, and rolled out into a sheet or plate.



THE MONT CENIS TUNNEL.

BETWEEN France and Italy there is a barrier of mountains which until quite recent times has been almost impassable, except to such as bid defiance to danger and fatigue. Over this mountain wall, 7,000 feet high, there were nineteen "passes." But of these, eight could only be used by foot passengers. The remaining eleven were called carriage roads, but not more than five were really passable for carriages.

The pass of Mont Cenis, which has now become so famous, is first mentioned in history as affording to Pepin and his army, about A.D. 755, a passage through the Alps on their way to aid the Pope in his struggle with the temporal powers. Other armies toiled over the poor mule-path on their various errands of subjugation or defence, until Napoleon, in 1803, commenced the work of making a carriage-road at that point. Nothing so marvellous in civil engineering had ever been attempted, and the work occupied seven years. From St. Michel, its western terminus, to Susa, the eastern terminus, the distance in a straight line is about thirty miles, but following the windings of the road, it is fifty. In that space the road ascends and descends about 5,000 feet, and sixteen mules could hardly drag a carriage up the steepest ascents.

After years of experimenting, the Mont

Cenis Tunnel was commenced in August, 1857. For thirteen years the workmen and their borers had been steadily nearing each other from the two ends. On Christmas afternoon, 1870, they exchanged shouts of greeting through the veil of rock which still divided them, and, soon after, the two excavations meeting perfectly, broke through the last foot of rock.

Thirty years ago M. Medail, of Bardonnèche, asserted that a shorter tunnel could be constructed between his village and Modane than at any other point in the Sardinian States having a similar elevation above the level of the sea. Ridicule and objections of every sort were hurled at those who dared to say such a thing could be done. Horrible dangers were imagined, and, worst of all, there were really some formidable difficulties. The ordinary mode of making long tunnels is by sinking vertical shafts or wells at convenient distances and working through from one to the other. This could hardly be done when a shaft sunk 722 yards from the entrance would be 1,000 feet deep, and at 6,333 yards the shaft must be 5,400 feet deep; a well nearly a mile deep and requiring by ordinary processes nearly forty years to dig! This mountain must be attacked at its opposite bases, and the two ends of the tunnel opened first. This seems at first, perhaps, a simple matter, requiring only patience and time; but how shall the workmen be supplied with air when they have

gnawed their way two or three miles into the heart of the earth? The shovel and the pick, even aided by gunpowder, would creep through the mountain so slowly that sixty years would pass before the tunnel would be completed. No machinery could be brought to their aid which depended on steam for motive power. For air must feed a fire before it can generate steam.

Mr. Whymper, who visited the works while in progress, thus describes the scene :—

“We entered a large building from which the strange noise had proceeded, and there we were standing before a machine which is one of the most wonderful that has ever been invented. Fixed in a square frame was a narrow cylinder, connected with a few simple-looking pipes and stopcocks—nothing very wonderful to look at. At about five feet in front of the machine was a great block of rock, upon which the experiments were being made; it was absolutely riddled by the borer; one hundred and eight holes, varying from one inch to four and a half in diameter, and averaging a yard in depth, pierced it in all directions. At a word from the engineer the machine was set in motion; now a borer darts out of the cylinder like a flash of lightning or the tongue of a serpent, and goes with a crash against a new part of the rock, chipping out several fragments at a blow; but quick as it was advanced it is withdrawn; bang, bang, it goes again in quick succession, faster than the eye can follow it—bang, bang, with a noise like a sudden crash on a gong. We gazed in silent astonishment; in ten seconds the head of the borer had eaten itself a hole; in a minute it had all but disappeared; in twelve it had drilled a hole nearly a yard deep, in rock harder than the average, as clean as a carpenter could in a piece of wood. The borer not only moved backwards and forwards, but was so arranged that it advanced as the hole grew deeper, and, more wonderful still, it had a second motion, not only advancing and retreating, but also steadily turning round and round. A jet of water

was also projected with great power into the hole all the time, answering the double purpose of cooling the borer and assisting the excavation.

M. Sommeiller, the engineer, was evidently amused at our astonishment, and again urged the engineer to put on—not more steam, but more air. If we were astonished before, we were doubly so now; the borer was projected backwards and forwards so fast that the bangs caused by the blows seemed to form a continuous rattle. We inquired the number of blows which it made per minute, and were told that the ordinary rate was one hundred and eighty to two hundred; ‘But,’ said M. Sommeiller, ‘it is much faster now; stay, I will calculate;’ and we found that it was working at the astonishing rate of *three hundred and forty strokes per minute*, or nearly one-half as fast again as the piston of an ordinary express locomotive, when moving sixty miles per hour!

Many forms of borers have been tried, and fresh ones are being invented. The most recent and the best discovered at present, has a Z shaped head. The chief wonder of the machine is the means by which it is worked—not by steam, but by air compressed by hydraulic power. There is hardly a steam-engine in the works. Everything is done by water-power; it creates the blasts for the forges, wields immense hammers, drives iron planing and drilling machines as effectually as any engine, and at a fraction of the cost.

We hastened through the 2,100 feet completed, in order to be at the end when some blasts were fired. In all this a double line of rails was laid, and the tunnel did not differ from any other. We had hardly waited a minute among the workmen before we were joined by two others, who had been entrusted with the delicate office of firing the matches, and very soon eight reports gave us leave to enter. The shields were hoisted up, and a dense cloud of smoke rushed out; but before reaching chaos at the end the whole had vanished, being driven forcibly out by the compressed air

which was turned on. The atmosphere here, owing to the blast of compressed air, at more than half a mile from the mouth, was just as pure and very much cooler than outside. After the blasts have been fired the *débris* is cleared away in the usual manner, the machine retreating on its tramway to allow the trucks to pass to the end ; it is then again fixed in position.

Next morning we returned to see it at work. Huge coils of pipes (looking like frightful slimy serpents) of compressed air and water lay about in seeming disorder. Eight of the cylinders already described were fixed in one massive frame, darting out their borers in all directions. Squeezed in and around it were upwards of twenty

men, in some of the most extraordinary positions the human body is capable of assuming. Boys were perched on the top with long tin cans, constantly oiling the parts. Now one of the borers would be stopped to be fixed in a fresh position ; men, in waterproof, would dodge under the other forked tongues to move it, getting in for small cascades of water which was being squirted into the holes. The noise of eight borers—bang, bang, being reverberated by the sides of the rock, was terrific. But above all the ceaseless rattle and babel could be heard the roaring of the air, as it rushed out to keep up the supply. All was disorder, and yet order : it was the triumph of order in the midst of confusion."



THE TEMPLES OF YUCATAN.

MEXICO, with its Aztecs and Toltecs, is a puzzle to architects as well as to ethnologists ; there are old buildings of a remarkable character in that land, which no one seems able to trace to the early civilizations of the old continent. Cities have been rediscovered which were inhabited and in the full tide of prosperity at the time of the Spanish Conquest. How much is reliable of the alleged history of the Aztecs and Toltecs between the fifth and fifteenth centuries is not certain ; but the remarkable temples of Mexico and Yucatan were built somewhere within that wide interval. Messrs. Stephens and Catherwood actually visited sixty old ruined cities in Yucatan, full of remarkable buildings, and supposed to be from 500 to 700 years old.

One of the most celebrated buildings of which detailed descriptions have been given, is the *teocalli*, or temple, of Cholula. It now looks little other than a vast mound of earth ; but examination shows it to be a

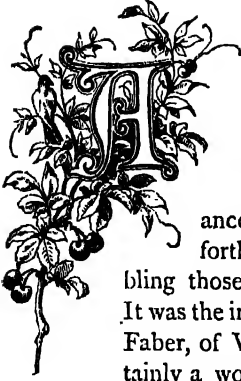
pyramid-temple, 1440 feet square at the base, by 177 feet high ; it is four times as large as the Great Pyramid of Egypt in area, but only one-third the height. The bulk of the pyramid is formed of clay and sun-dried bricks. It consists of four terraces ; and on the top was once a temple of the Toltec god of the air. It contains spacious sepulchral cavities ; a square chamber formed of stone and cypress-wood, when discovered a few years ago, was found to contain two skeletons and several painted vases.

The *teocalli* at Palenque was a far more splendid structure, comprising sanctuaries, sepulchres, courts, cloisters, galleries, and cells ; forming altogether a spacious quadrangle enclosed by porticoes, and resting on a platform composed of three graduated terraces. Much of the interior is decorated with sculptures and hieroglyphics in stucco. The palace of Mitla is another of these large and remarkable Toltec structures, and seems to consist of five tombs of kings, exhibiting notable works in porphyry, stone, stucco, and cypress-wood, adorned with elaborately painted representations of sacrifices, trophies, weapons, etc.



RUINED TEMPLE IN MEXICO.

TALKING MACHINES.

THE TELEPHONE.—THE PHONOGRAPH.—
THE MICROPHONE.

FEW years ago there was exhibited in London a Talking Machine, which by mechanical appliances was made to give forth utterances resembling those of a human being. It was the invention of Professor Faber, of Vienna, and was certainly a wonderful specimen of human ingenuity. The machine had a special utility, as illustrating the science of acoustics. It had a mouth, with tongue and lips, which were set in motion by a mechanical apparatus which freed a portion of air from a large bellows, and so controlled it as to produce the sound required. The instrument pronounced with great clearness every letter of the alphabet, many words, and a few sentences perfectly; not merely set words, but any words the audience chose to name. It also laughed, and uttered other cries expressive of human passions, to the astonishment of all who heard it.

What became of this ingenious invention we know not; but its wonders have been entirely eclipsed by those of the modern telephone and phonograph, by which it would seem that sound can be conveyed an unlimited distance, and even be preserved in a permanent form, and reproduced at any future period.

No easy task is it to decide whether the palm of merit should be awarded to the telephone, the phonograph, or the microphone, the three latest and most extraordinary gifts of science to our time. All three inventions are closely affiliated in the order and method of their discovery. The telephone, which "wafts a sigh from Indus to the Pole," is by no means yet valued as it will be when the ingenious minds to

which we owe it have had time to perfect their apparatus. The phonograph, which actually records speech and sound in a portable and reproducible form, was discovered by Mr. Edison, it is said, while trifling with his telephone. The little needle on the diaphragm pricked his finger, and, as he drew it away, made an interrupted line of blood upon its surface by the vibration of the point, whereupon he at once placed some Morse paper so that the diaphragm could travel over it, and, speaking through the tube, found small but familiar "dots and dashes" inscribed. Reversing the process, and so managing the impressed paper as to make the diaphragm vibrate, it repeated to him faintly the "Hallowa" which he had shouted at the machine. We might fairly say this was the voice of science herself rewarding a great inventor with one of the most magical of her hidden secrets, for Mr. Edison went to work forthwith, and, neither eating, drinking, nor sleeping, for two days and nights, toiled until he had produced and brought into working order the first phonograph.

The Telephone.—The first idea of the telephone appears to have been conceived by Mr. Wheatstone, while engaged in perfecting his telegraphic invention; and he succeeded so far as to convey the tick of a clock through wire to an electro-magnetic clock. This clock was exhibited before the Royal Society in 1840. Then came, in 1852, Professor Reis, with an instrument a little further developed than Wheatstone's, and which is thus described: "The first telephone was of a most primitive nature. The originating instrument was a bung of a beer-barrel hollowed out, and the cone formed in this way was closed with the skin of a German sausage, which did service as a membrane. To this was fixed with a drop

of sealing-wax a little strip of platinum, representing the hammer of the ear, and which 'made' or 'broke' the electric circuit precisely as in the instruments of a later date. The receiving instrument was a knitting needle, surrounded with a coil of wire, and placed on a violin to serve as a sounding-board." . . .

Several other inventions of a similar character were brought out during the next few years; but the greatest success was reserved for Professor Graham Bell, who gives the following account of his earlier efforts in this direction:—

"Many of those present may recollect the invention by my father of a means of representing, in a wonderfully accurate manner, the positions of the vocal organs in forming sounds. Together we carried on quite a number of experiments, seeking to discover the correct mechanism of English and foreign elements of speech; and I remember especially an investigation in which we were engaged concerning the musical relations of vowel sounds. When vowel sounds are whispered, each vowel seems to possess a particular pitch of its own, and by whispering certain vowels in succession a musical scale can be distinctly perceived. Our aim was to determine the natural pitch of each vowel; but unexpected difficulties made their appearance, for many of the vowels seemed to possess a double pitch,—one due, probably, to the resonance of the air in the mouth, and the other to the resonance of the air contained in the cavity behind the tongue, comprehending the pharynx and larynx. I hit upon an expedient for determining the pitch which at that time I thought to be original with myself. It consisted in vibrating a tuning-fork in front of the mouth while the positions of the vocal organs for the various vowel sound were silently taken. It was found that each vowel position caused the reinforcement of some particular fork or forks."

The following are the leading principles of Professor Bell's invention:—

"We must first comprehend the mode in which the sonorous transmission through

the wire is brought about; for this it is which really constitutes the principle of the telephone. Ordinary telegraphic coils of insulated wire are applied to the poles of a powerful compound permanent magnet; and in front of these is a thin vibrating diaphragm or membrane, with a metallic contact-piece cemented to it. A mouth-piece or trumpet mouth, fitted to collect and intensify waves of sound, is placed near the other surface of the diaphragm. It is known that the motion of steel or iron in front of the poles of a magnet creates a disturbance of electricity in coils surrounding those poles; and the duration of this current will coincide with the vibratory motion of the steel or iron. When, therefore, the human voice (or any other suitable sound) impinges through the tube against the diaphragm, the diaphragm itself begins to vibrate, and the contact-piece awakens (so to speak) electrical action in the coils of wire surrounding the poles of the magnet; not a current, but a series of undulations, something like those produced by the voice in the air around us. The undulations in the coil produce a current in the ordinary telegraph wire with which it is placed in connection. A similar apparatus at the other end is hereby set in action, but in reverse order; that is, the wire affects another coil, the coil another diaphragm, and the diaphragm another tube, in which the sounds are reproduced in audible vibrations."

This invention was successfully applied to the transmission of musical sounds by Mr. Cromwell Varley, who, in 1877, publicly gave illustrations in London.

One of the most interesting and valuable applications of Professor Bell's telephone in the United States was seen in a railway disaster near Hartford, Connecticut. An excursion train, returning from Moody and Sankey's revival meetings, plunged through a bridge, killing or wounding many passengers. Brought by telegraph wires to Hartford, the news was taken up by a system of telephone wires connecting a chemist's shop with the residences of twenty-one physicians.

So prompt was the summons, that in half an hour the physicians, fully equipped, were at the railway station, where a wrecking-train conveyed them to the scene of death and suffering. Thirteen thousand telephones are now in operation in the United States.

Dolbear's telephone differs from that of Professor Bell in that it requires the employment of a magnetic battery or an electro magnet to generate the electric current; but in compensation for this, the sounds produced at the receiving end are audible to a room full of people. The mechanism of the electric bell is used in conjunction with the telephone to call attention to its utterances; and with a pair of telephones and a couple of electric bells, a perfect system of communication may be established between any two parts of the building.

The Phonograph.—The telephone, however, has been followed by even a more wonderful invention—the phonograph. Mr. Edison, of New Jersey, has devised a method by which the voice can actually be imprinted on a thin slip of metal, which may be removed, the tones being reproducible on another phonograph. This amazing invention will be best described by quoting the account of it given in the *Times*:—

"Not many weeks have passed since we were startled by the announcement that we could converse audibly with each other, although hundreds of miles apart, by means of so many miles of wire with a little electro magnet at each end. Another wonder is now promised us—an invention, purely mechanical in its nature, by means of which words spoken by the human voice can be, so to speak, stored up and reproduced at will over and over again, hundreds, it may be thousands, of times. What will be thought of a piece of mechanism by means of which a message of any length can be spoken on to a plate of metal,—that plate sent by post to any part of the world, and the message absolutely respoken in the very voice of the sender, purely by mechanical agency? What, too, shall be said of a mere machine by means of which the old familiar voice of

one who is no longer with us on earth can be heard speaking to us in the very tones and measure to which our ears were once accustomed?

In the present machine for recording a long message, as soon as one strip of the tin-foil is filled, it is removed and replaced by others until the communication has been completed. In using the machine for the purpose of correspondence, the metal strips are removed from the cylinder and sent to the person with whom the speaker desires to correspond, and who must possess a machine similar to that used by the sender. The person receiving the strips places them in turn on the cylinder of his apparatus, applies the transmitter, and puts the cylinder in motion, when he hears his friend's voice speaking to him from the indented metal. And he can repeat the contents of the missive as often as he pleases until he has worn the metal through. The sender can make an indefinite number of copies of his communication by taking a plaster of Paris cast of the original strip and rubbing off impressions from it on a clean sheet of foil. It will thus be seen, as we have stated, that the voices of those who have left us, either for ever or for a season only, can be heard talking with us if we so desire it."

The last new development is a speaking clock—a species of horological watchman crying out the hour far more punctually and distinctly than the ancient "Charleys." Mr. Edison constructed an instrument which, instead of striking the hours like vulgar clocks, "tells its hearers, with a human voice, what o'clock it is, interspersed with a few appropriate remarks. For instance, when the hour of one arrives, it calls out, 'One o'clock—time for lunch!' to the astonishment," as the narrator gravely observes, "of every one who has not heard it before." Far from underrating the value of Mr. Edison's discovery, we are inclined to predict for it a brilliant career.

The Microphone.—The last of these amazing discoveries in that subtle region where electricity, magnetism, motion, and



OSTRICHES.

FROM A PAINTING BY HARRISON WEIR.



sound, execute their invisible interchanges—has sprung forth to startle and benefit the world in a most curious way. A paper lately read before the Royal Society announced the invention by Professor Hughes of this astonishing instrument or apparatus which opens to our ears a universe of sounds hitherto inaudible, just as the microscope revealed a world of minute life and structure unknown before. Like Mr. Edison, Professor Hughes was one day employing the telephone for various acoustic experiments. He wished to investigate the effect of sonorous vibrations upon the electrical behaviour of conductors, led to this idea by the way in which solenium is known to become electrically affected by light, and also by the researches of Sir William Thomson upon the electrical conduct of strained wires. The professor had a stretched wire on his telephonic circuit, and, though he talked and plucked at it, no effect followed until it broke.

At that moment the telephone uttered a sort of "shh," which was very curious. He placed the broken ends together under a weight, and obtained again faint sounds, which were improved when the wires were connected by iron nails, or a steel watch-chain, the more pieces and more diverse in substance from the conductor seemingly the better. Experimenting still farther with his broken circuit, especially in the direction of this whisper from science about "More pieces," he found metallic powder of fine metal filings wonderfully augment the power of transmitting sounds; while shot in a bright condition, platinum, carbon, and mercury, also gave good results, particularly the last. Following up this clue, Professor Hughes hit upon a plan of suspending finely divided mercury in a stick of charcoal by heating the latter and plunging it into quicksilver, whereupon the charcoal becomes infiltrated with the mercury in minutest but continuous particles. Inserting a "transmitter" of this sort in his circuit, an absolutely amazing sensitiveness to sound, as well as power of conveying it with the utmost fidelity, was displayed by

the apparatus. A touch of the finger on the vibrating plate was conducted to the speaking end in volume of vibration like the rustle of a forest; the stroking of a camel's-hair brush on a card was magnified into the sound of a loud whisper; the beating of a pulse, or the tick of a watch, was found to pass with perfect clearness through a resistance representing a hundred miles of space; and, when a fly happened to walk over the plate, the tramp of its feet was most distinctly caught like that of some six-legged horse trotting, and it was, moreover, heard to trumpet from its raised proboscis like an elephant in an Indian jungle. Sounds, in fact, totally inaudible before to human ears, were arrested and reported by this simple and accidental expedient of interrupting the electrical circuit with a finely divided conducting material.

There is indeed almost no doubt that the perfected microphone will convey to us that hidden ripple of the sap rising in growing trees and plants which Humboldt said might be a continuous melody in the auditory organs of earth's smallest creatures. The "music of the spheres"—if we could only find a way of localising the vibrations of a star, as we can isolate and examine its light with the spectroscope—would possibly become sensible to us; and Lorenzo, had he known of this magical invention, need not have told Jessica that we should never catch a note of that cosmic anthem which each golden orb "in his motion like an angel sings, Still quiring to the young-eyed cherubins." To "hear the grass grow" has become, by this exquisitely delicate discovery, no longer an utterly inconceivable exercise for sharp ears. It may be expected to replace the clumsy methods of the stethoscope and sphygmograph with a most accurate appliance, which will tell the doctor's ear exactly what the heart and the pulse have to say about his patient's case. Some application of it, by properly employing a little portable battery and circuit, may probably be hit upon which will greatly alleviate, or even wholly remove, the dis-

abilities of the deaf. But, more than this, while magnifying audible sound, and reporting to us tones which were before inaudible, this new invention is said to solve all difficulties as to articulateness in telephonic transmission. It conveys speech, or music, or the slightest inflections of accent and *timbre*, with perfect distinctness, and with a power so complete that it increases indefinitely that which the telephone has exhibited with a homogeneous conducting wire.

In introducing his admirable discovery very modestly to the Royal Society, the inventor remarked, "It is impossible to say what may be the applications or effects of that which I have had the honour of bringing before you;" and to his great honour Professor Hughes added, "I do not intend to take out a patent, as the facts I have mentioned belong more to the domain of discovery than of invention. No doubt inventors will ere long improve on the form and materials I have employed. I have already my reward in the distinction of submitting my researches to the Royal Society." This is, indeed, a spirit worthy of such great services to human knowledge, and Professor Hughes has enhanced the fame of his invention by the unselfish manner in which he gives the world the full benefit of the discovery.

Although difficult to convey, the explanation of this wonderful power of the microphone to magnify sounds does not seem beyond the reach of simple phraseology. There are two wave-currents running through the telephonic circuit—one of electricity, the other of sound vibrations—and the effect produced by the latter in modifying the resistance and conductivity of a circuit is little or none, so long as the wire remains homogeneous and continuous. If, however, a portion of this be, as in the transmitter, composed of a series of very minute subdivisions, electrical continuity being still preserved, the sonorous waves are no longer neutralised in their effect upon the electric flow. The molecules of the mercury are thrust together or drawn

apart, becoming alternately longer and more resistant, or shorter and more permeable, so that every briefest and smallest sound-disturbance acts and records itself in the effect produced upon the electrical flow, and the variations of these electric currents reproduce the order, force, and articulation, of the sounds. With diagrams this theory of the action—which is the one put forward by the accomplished inventor—might have been rendered much more intelligible; but enough is said to afford some notion of the manner in which the microphone is thought to work. As its name implies, it is the magnifier of sound; but it defines and reveals as well as carries sound, and cannot fail to prove an immensely valuable addition to the telephone, while it may be confidently expected that the phonograph will be made available for recording by its help some of the unexpected things to which we shall be enabled to listen through this fairy gift of science. It has been suggested, for example, that molecular motion itself, under certain circumstances, may be conveyed to our ears by this apparatus. We may overhear, for instance, the inner vibrations of a mass of heated metal, or the sound produced by chemical combinations and reactions. Step by step, man thus explores the hidden marvels and resources of that world of nature which is at once his palace and his prison. Each great secret wrested from the silent but beneficent Spirit of the universe confers new powers, and makes life richer and more commanding. Is it then the caprice of that Spirit which has imparted these two splendid secrets of the phonograph and the microphone by apparently the most trivial accidents? A pricked finger produces one for us; a broken wire led Professor Hughes to discover the other. There is no caprice in this mystery. The hour comes, the patient seeker is on the right road, and, at the moment when he least expects it, Nature opens her hand, and discloses another of her far-reaching treasures of knowledge.

ESCAPE FROM A TINTERERO.



MEXICO boasts of a diver of the name of Don Pablo Ochow, who was for many years superintendent of the pearl fishery and a most expert diver. He gave Lieutenant Hardy a vivid account of one of his watery adventures :—

The Placér de la Piedra Negada, which is near Loréto, was supposed to have quantities of very large pearl-oysters round it—a supposition which was at once confirmed by the great difficulty of finding this sunken rock. Don Pablo, however, succeeded in sounding it, and, in search of specimens of the largest and oldest shells, dived down in eleven fathoms water. The rock is not above a hundred and fifty or two hundred yards in circumference; and our adventurer swam round and examined it in all directions, but without meeting any inducement to prolong his stay.

Accordingly, being quite satisfied that there were no oysters, he thought of ascending to the surface of the water; but first he cast a look upwards, as all divers are obliged to do who hope to avoid the hungry jaws of a monster. If the coast is clear they may rise without apprehension. Don Pablo, however, when he cast a hasty glance upwards, found that a tinterero had taken a station three or four yards immediately above him, and most probably had been watching during the whole time he had been down. A double-pointed stick was a useless weapon against such a tinterero, as its mouth was of such enormous dimensions that both man and stick would be swallowed together. He therefore felt himself rather nervous, as his retreat was now completely intercepted. But under water time is too great an object to be spent in reflection; and therefore he swam

round to another part of the rock, hoping by this means to avoid the vigilance of his persecutor.

What was his horror and dismay, when he again looked, to find the pertinacious tinterero still hovering over him, as a hawk would follow a bird! He described him as having large, round, and inflamed eyes, apparently just ready to dart from the sockets with eagerness, and a mouth (at the recollection of which he still shuddered) that was continually opening and shutting, as if the monster was already, in imagination, devouring his victim, or at least that the contemplation of his prey imparted a foretaste of the feast.

Two alternatives now presented themselves to the mind of Don Pablo—one, to suffer himself to be drowned; the other, to be eaten. He had already been under water so considerable a time that he found it impossible any longer to retain his breath, and was on the point of giving himself up for lost with as much philosophy as he possessed.

But what is dearer than life? The invention of man is seldom at a loss to find expedients for its preservation in cases of great extremity. On a sudden he recollected that on one side of the rock he had observed a sandy spot; and to this he swam with all imaginable speed, his attentive friend still watching his movements, and keeping a measured pace with him.

As soon as he reached the spot, he commenced stirring it rapidly with his pointed stick, in such a way that the fine particles rose and rendered the water perfectly turbid, so that he could not see the monster, nor the monster him. Availing himself of the cloud by which himself and the tinterero were enveloped, he swam very far out in a transversal direction, and reached the surface in safety, although completely exhausted. Fortunately, he rose

close to one of the boats; and those who were within, seeing him in such a state, and knowing that an enemy must have been persecuting him, and that by some artifice he had saved his life, jumped overboard, as

is their common practice in such cases, to frighten the creature away by splashing the water, and Don Pablo was taken into the boat more dead than alive. Thanks to a good constitution, he soon recovered.



TATTOOING EXTRAORDINARY.

THE following very extraordinary account of tattooing is from an American newspaper: "At ex-mayor Barnum's residence we saw a wonder of tattooing on the person of Captain George Costentenus, a descendant of a noble Greek family from the province of Albania. His statement is that while he, together with an American and a Spaniard, was mining in Chinese Tartary in 1867, a rebellion arose, and the three joined the insurgents. Ill-luck coming to their cause, they were taken prisoners, and subjected to the tattooing process for three months, as a punishment, in lieu of having their heads cut off. He says that the process causes such terrible pain that it required six men to hold him while one performed the operation. After it was completed all three escaped from the prison; but the American only survived five or six months. The Spaniard lost his eyesight, and died in Manilla; but Captain Costentenus survives, and is in good health.

The tattooing was done with indigo and cinnabar, producing blue and red colours, and there is not a single spot on his body which is not covered with these colours; so that it is impossible to discover what was the natural colour of his skin except by his ears and the soles of his feet, which are the only parts they did not cover with tattoo. He appeared at first sight as though he was clothed with very close-fitting tights made of a shawl or of very soft fine drugget. Upon a close inspection, however, it is seen that he is entirely naked, and that the apparent tights are an illusion. More-

over, his whole person is found to be covered with a great variety of animal figures, with their names most ingeniously and skilfully printed into the cuticle. On the forehead are animals and inscriptions, and on the face star-like figures. On the hands are numerous red points and figures resembling sculptures, as well as long-tailed panther-like shapes. On the neck, chest, abdomen, back, and extremities the skin is a mass of symmetrically arranged and admirably executed figures of monkeys, tigers, lions, elephants, peacocks, storks, swans, snakes, crocodiles, lizards, mingled with bows, arrows, leaves, flowers, and fruits; on the palms of the hands are indescribable figures; and little figures are on the inside of the fingers. On the upper side of both feet to the toes are blue points, and from the toes to the nails are red lines. Altogether there are 387 tattooed pictures on the entire body—on the forehead, 2; neck, 8; chest, 50; back, 37; abdomen, 52; upper extremities, 101; lower extremities, 137.

The captain is certainly one of the greatest human curiosities ever seen. He has travelled in all countries except America. He speaks English, French, Spanish, and Italian; and he understands the Arabic, the Persian, and several other languages. He is about five feet ten inches high, has a superb physique; his hair is straight, jet black, and glossy. To the touch his skin has a soft velvety feeling, and it has so much the appearance of being clothed that he might walk through the public streets without any one suspecting that he was not dressed in tights. We understand that Mr. Barnum has engaged him to travel with his great show at a salary of one hundred dollars a day."



THROUGH THE RAPIDS.



Lou go in that canoe?" said a dusky Redskin to me as, bundle of blankets and things under my arm, I was making for my boat on the river. "You go in that canoe?" shaking his head in a melancholy fashion; "me very sorry." I inquired wherefore. "Because," said he, "that canoe is small, and down yonder" (pointing to a bend in the river) "the waters are very strong, and that canoe will be smashed, and you will be drowned, and I am very sorry, for you."

This was rather a sinister start for me, but I had determined to go down country by the river, simply because I did not fancy walking some two hundred miles with my blankets and "fixins" strapped across my back, and the boat which my friend condemned chanced to be the only one available. So I bade the kind-hearted Indian

cheer up, and told him that the Great Father would look after me, and went on my way. Yet let me confess to a slight sensation of anxiety stirred by this doleful address. *Absit omen*, thought I.

But it was impossible to be disturbed by forebodings of evil on such a glorious morning. How bright was the fresh sunshine gleaming on the mighty river! How keen and bracing the mountain air! How stupendous the grand old mountains, standing round with the green of their pines and bright yellow of their deciduous trees, for it was autumn! Then how cheery were we all, motley company as we were, Yanks and Britishers, Mexicans and Norwegians, twenty, if I remember right, in all. The skipper, a "gentleman of colour," managed the rudder, which consisted of a huge oar, and four stout white men plied the oars. Presently we were all on board, and started down stream at a rattling pace.

For about an hour the waters, though swift, were smooth and safe. Then, however, we descried in the distance the white and broken current, which proclaimed a riffle or rapid. This being the first, we rather "funked" it, and all thought we should like to get out and walk past the piece of bad water. According we landed, and had the pleasure of seeing our craft dropped over the place of danger by means of a rope, with none but the steersman on board. Then we re-embarked, and shot ahead again.

Every five minutes the interest of the trip varied and increased. Every turn in the river revealed some new kind of scenery, of which nothing was commonplace or tame, but, on the contrary, all was romantic, fantastic, or sublime. Occasionally the banks on either side would slope gently upwards, adorned with graceful trees and shrubs. More frequently they would rise up sheer from the water's edge, forming lofty ranges of rock topped with sable pines. Now we would enter one of those glorious cañons, or gorges, for which, like the Columbia and other western rivers, our river (it is the Frazer I am speaking of, in British Columbia) was remarkable. In these cañons the water is compressed into a narrow channel of unknown depth, and flows peaceably, as though in its great strength it were asleep, or only awake enough to play with its countless eddies. The great brown rocks on either hand towered like massive walls to a height of 1,000 feet. The silence in passing down between those walls, with nothing but the depths of brown water below and the expanse of blue sky above, was something perfectly appalling. We dared not converse then; the only sound heard was the splash of our oars. Presently, however, as we approach the extremity of the defile, we hear the distant roar. The stream, it would appear, has been gathering up its strength in that interlude of slumbering silence. For lo! in the distance "the white horses" are charging the rocks, and we are being quickly borne into the heart of the fray.

It is where the stream is seeking a lower level that these conflicts occur. It then goes raging over the mighty boulders which encumber its bed. There is a twofold danger in such places. There is the risk of your boat having her bow turned by the back movement of the waves striking on those boulders, and there is, of course, the risk of collision with those rough-looking monsters themselves. It is essential to put on all possible headway in running those "riffles," because if your boat were once turned so as to present her side to the current, she would in a moment be swamped or knocked into shivers. And then a long farewell! No swimming in that whirling tide! None! The victim falls into the hands of a hundred contending currents, and, torn to pieces, or battered into jelly, he is hurled along, never to be seen by mortal more. But given a well-steered boat with plenty of way on, there is no danger; the craft will then dash down over those rough places, on the back of those fierce white horses, at a rate of little less than twenty miles an hour. We had, however, one awkward experience.

We had halted at noon for lunch. Hastily gathering some of the timber strewn along the bank, we had made a fire and boiled water for tea, that indispensable ally of the pioneer. Recruited with this, not without adjuncts of bread and bacon, we had re-embarked, and were moving swiftly through the water. Presently, on a sudden bend, we saw right ahead the formidable waters of what is called the Chalcoaten Riffle, and as soon as we saw we were in it.

"Now boys, look to your oars!" shouted the darkey at the helm; "give her way, my lads; that's it; push her through; throw your weight into her!"

Encouraged by these and similar appeals, we tore away regardless of the fierce violence and deafening roar of the raging stream. But—ha! what's this? has the steersman missed the channel, or is the water shallower than he thought? I can't tell, but this I know (nor am I likely to forget it!) just where the river was narrowest and wildest, we came bump on a rock in mid-stream, a

cross-beam was stove in, and—well “the boat was a wreck, and we were all in the water?” Not so, or I should never have survived to tell it; but what *did* happen was this. After a moment of intense curiosity to know what was to come next, a moment which seemed to last an hour, the good boat did the most sensible thing it could do: it jumped from off its boulder full six feet into the seething cauldron beneath, and, oh joy! we were saved.

Hereupon the men showed their sense of relief by sundry profane ejaculations, after the manner of gold-diggers, for such they were. To some who irreverently used the name of the Saviour in speaking of their lucky escape, I remember observing that to Him and to none other they owed a deliverance so miraculous and so unmerited.

And so we bowled along at fifty miles a day, and our trip never lost in interest. Now we would hurry past some ugly boulder lurking in our way, almost touching

him.* Another time we would mistake the channel and come broadside on to a grim-looking rock in the middle of the river; but just when on the point of being destroyed, we were borne swiftly past it by the mighty current, and taken down a steep and winding way to a still reach of water below. In such a case oars or rudder could do nothing, but providentially the current carried us safe away from the danger.

Suffice it to say, the whole trip was completed without loss of life or limb. Only the good boat came to grief; this, however, within but a few miles of our destination, and after we had left her, with our effects. It was at a very bad and dangerous riffle, where the water was unusually shallow. The bark was being let down over the place by means of a rope attached to it; but unluckily the stream got the better of her, and took the liberty of rudely driving her upon a rock, where, in a moment, she went to pieces like a box of matches.

FORTY FEET OF FIRE;

OR, THE MINES OF AVONDALE.

DEATH proclaims a holocaust—
Two hundred men must die!
And he cometh not like a thief in the night,
But with banners lifted high.
He calleth the north wind out of the north
To blow him a signal blast,
And to plough the air with a fiery share,
And to sow the sparks, broadcast.
No fear hath he of the arm of flesh,
And he maketh the winds to cry:
“Let come who will to the awful hill,
And his strength against me try!”
So quick those sparks along the land,
Into blades of flame have sprung;
So quick the piteous face of Heaven
With a veil of black is hung:
And men are telling the news with words,
And women with tears and sighs,

And the children with the frightened souls
That are staring from their eyes.
“Death! death, is holding a holocaust!
And never was seen such a pyre—
Head packed to head, and above them
spread
Full forty feet of fire!”
From hill to hill-top runs the cry,
Through farm and village and town,
And higher and higher—“The mine’s on
fire!”
Two hundred men sealed down!
And not with the dewy hand o’th’ earth,
And not with the leaves of the trees—
Nor is it the waves that roof their graves,
Oh, no, it is none of these.
From sight and sound walled round and
round,
For God’s sake haste to the pyre!

In the black coal-beds, and above their
heads,
Full forty feet of fire !”

And now the villagers swarm like bees,
And the miners catch the sound,
And climb to the land with their picks in
hand

From their chambers in the ground.
For high and low, and rich and poor,
To a holy instinct true,
Stand forth as if all hearts were one,
And a-tremble through and through.
Oil, side by side, they roll like a tide,
And the voice grows high and higher ;
“Come woe, come weal, we must break the
seal

Of that forty feet of fire !”

Now cries of fear, shrill far and near,
And a palsy shakes the hands ;
And the blood runs cold, for behold,
behold

The gap where the enemy stands !
Oh, never had painter scenes to paint
So ghastly and grim as these,—
Mothers that comfortless sit on the ground,
With their babies on their knees ;
The brown-cheeked lad, and the maid as sad
As the grandame and the sire,
And ’twixt them all and their loved, that
wall,—

That terrible wall of fire !

And the grapple begins, and the foremost set
Their lives against death’s laws ;
And the blazing timbers catch in their arms
And bear them off like straws.
They have lowered the flaunting flag from
its place,—

They will die in the gap or save ;
For this they have done, whate’er be won,
They have conquered fear of the grave.
They have baffled—have driven the enemy,
And with better courage strive ;
“Who knoweth,” they say, “God’s mercy
to-day,

And the souls he may save alive !”

So now the hands have dugged through the
brands—

They can see the awful stairs,

And there falls a hush that is only stirred
By the weeping women’s prayers.

“Now, who will peril his limb and life,
In the damps of the dreadful mine ?”

“I ! I, and I !” a dozen cry,
As they forward step from line !
And down from the light and out of sight,
Man after man they go,
And now arise the unanswered cries
As they beat on the door below.

And night came down—what a woful night !
To the youths and maidens fair ;
What a night in the lives of the miners’
wives

At the gate of a dumb despair.
And the stars have set their solemn watch
In silence o’er the hill,
And the children sleep, and the women
weep,

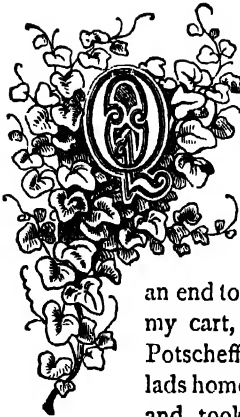
And the workers work with a will.
And so the hours drag on and on,
And so the night goes by ;
And at last the east is grey with dawn,
And the sun is in the sky.

Hark, hark ! the barricades are down,
The torchlights farther spread ;
The doubt is past—they are found at last,—
Dead, dead,—two hundred dead !
Face, close to face, in a long embrace,
And the young and the faded hair,—
Gold over the snow, as if meant to show
Love stayed beyond despair.
Two hundred men at yester morn,
With the work of the world to strive ;
Two hundred yet when the sun was set,
And not a soul alive !

Oh ! long the brawny Plymouth men,
As they sit by their winter fires ;
Shall tell the tale of Avondale,
And its awful pyre of pyres :
Shall hush their breath, and tell how Death
His flag did widely wave,
And how in shrouds of smoky clouds,
The miners fought in their graves.
And how in a still procession
They passed from that fearful glen,
And there shall he wail, in Avondale,
For the brave two hundred men.

Alice Cary.

VISIT TO THE DIAMOND MINES.



JUST recently (in the summer of 1874) Mr. J. A. Froude paid a visit to South Africa, and thus describes his visit:—

“The storms put an end to my gipsy life. I sold my cart, mules, and guns at Potscheffstrom, sent my two lads home by a wagon to Natal, and took to the mail cart.

The roads are tracks littered with stones the size of thirty-two pound cannon balls. The mail travels night and day with ten mules or horses, and plunges on with supreme disregard either of rock or hole. The cart is roofed and curtained with leather. The brass buttons by which the curtains are fastened are so conveniently arranged that at each jolt you are likely to have your temple cut or your cheek laid open. The distance from Potscheffstrom to this place is from four to five hundred miles. I had several fellow-passengers, all characteristic of the spot for which I was bound. One was a Jew diamond dealer, another a store-keeper, another a digger, another a land-shark or speculator. A fifth amused and instructed me. ‘When I first came to this country, sir,’ he said, ‘I tried industry; but it didn’t pay, and I took to scheming, and did better.’ His scheming consisted in going to England when the diamond diggings were opened, buying a gambling and drinking saloon, with all necessary fittings, securing the services of half a dozen young ladies from the Haymarket to attend, and carrying it all out and setting it going. With this contrivance he made thirty or forty thousand pounds in one year; but he lost it the next in gambling.

‘Alas!’ he said, in a remorseful tone, ‘all that I touch turns to gold. Any fool can make a fortune here; but it requires a wise man to keep it!’

The nearer we approach the fields, the louder and more universal the cry against the injustice done to the Free States. An Englishman whom I met at Christiana told me he was ashamed of his country.

On the evening of the third day after leaving Potscheffstrom we came down to the Vaal river, intending to cross in a ferryboat an hour before sunset. The thunder-clouds had unfortunately gathered up that afternoon blacker than I had yet seen them. Between four and five o’clock the storm began, and between the darkness and the blinding effects of the lightning, in the intervals of the flashes we could scarcely see ten yards from us. Even in South Africa I never saw such a display of celestial fireworks. The lightning was rose-colour, deepening at times to crimson. Each flash appeared like a cross, a vertical line seeming to strike the earth, a second line crossing it horizontally. The air was a blaze of fire. The rain fell in such a deluge that the plain in a few minutes was like a lake. The horses stood shivering up to their fetlocks in water. At one time there was no interval between the flash and the report, so that we were in the very centre of the storm. The sense of utter helplessness prevented me from being nervous. I sat still and looked at it in mere amazement. In two hours it was over. The sky cleared almost suddenly, and, with the dripping landscape shining in the light of a summer sunset, we splashed on to the river, here about as broad as the Thames at Westminster. We crossed with some trouble, the ferryboat being half full of water. Night being now on us in earnest, we had to wait at the ferryman’s hut till the moon rose. He had caught some barbel (so he called them) in the river with night lines. One of these monsters, as big as a moderate sized pig, with an enormous head and long horns, the conductor bought to take on and sell at the diamond fields. The

diggers are open-handed, and the price of anything at Kimberley (as my speculating friend told me) is whatever the owner likes to ask. I objected to this addition to our company in the wagon, so it was lashed to a pole underneath, the tail flapping on the sands. At 10.30 we started (having lost time to make up) with the half-broken horses. I asked how the road was, and got a shrug for an answer. In a few minutes we were bounding at full speed over a track littered with cannon balls, and our bodies flying like shuttlecocks between our seats and the roof. I for one felt as if I should go to pieces. At intervals the conductor looked in, coolly saying, 'Well, gentlemen, how do you feel yourselves?'

He knew, by experience, I suppose, that we should be none the worse for it; and people do not go to South Africa to be comfortable. Enough that at ten this morning we arrived at the spot which has caused so much heartburning in South African society, and disturbed the market for jewels all over the world.

The town of Kimberley, so called because Lord Kimberley was the colonial minister who is responsible for the annexation of this precious possession, is like a squalid Wimbledon Camp set down in an arid desert. The houses are of iron, wood, and canvas, every particle of which has been brought out from England, and has been carried up on wagons from the sea. The streets are axle deep in what is either dust or mud, according to the season. The inhabitants who are of all nations and colours, muster at the present time between twenty and thirty thousand, and may be described as the Bohemians of the four continents. By Bohemian I do not mean to be uncomplimentary, I mean merely a class of persons who prefer adventure and speculation to settled industry, and who do not work well in the harness of ordinary life. Here are diggers from America and Australia, German speculators, Fenian head-centres, traders, saloon-keepers, professional gamblers, bar-risters (I heard one of these say it was a lawyer's Eldorado), ex-officers of the army

and navy, younger sons of good family, who have not taken to a profession or been obliged to leave it. A marvellous motley assemblage, among whom money flows like water from the amazing productiveness of the mine; and in the midst of them a hundred or so keen-eyed Jewish merchants, who have gathered like eagles over their prey, and a few thousand natives who have come to work for wages, to steal diamonds, and to lay their earnings out in rifles and powder.

There are three pits out of which the diamonds are taken. One of them, two miles off, is comparatively unproductive; one better, but still negligently worked; the third is the famous Koppe, about which the town has formed itself. This Koppe was once a rounded hillock, swelling out of the plain and covered with mimosa trees, under the shade of which passing wagons stopped to rest. Eyes negligently looking round one day saw something shining in the grass; a tuft was pulled up, and more sparks were seen about the roots. Digging began, and it was discovered through the level shale which forms the ordinary surface an oval hole had been cut, as if by some elliptical boring tool, working with singular evenness. The length of the opening is about 1200 feet, the breadth 900, the sides perpendicular, the depth unknown, for they are afraid to bore. A discovery that the bottom is near would destroy the value of the property. A discovery that there is no bottom would convulse the diamond market. At present they have cut down about 120 feet.

Four or five thousand blacks are picking into the blue crumbling substance, neither clay nor stone, in which the diamonds are embedded. The area is divided into claims, or quadrilateral sections, thirty feet by twenty, which are held as freeholds, and again are sub-divided into half and quarter claims. Each owner works by himself, or with his own servants. He has his own wire rope, and his own basket, by which he sends his stuff to the surface to be washed. The rim of the pit is fringed with windlasses.

The descending wire-ropes stretch from them as thick as gossamers on an autumn meadow. The system is as demoralising as it is ruinous. The owner cannot be ubiquitous ; if he is with his washing-cradle, his servants in the pit steal his most valuable stones and secrete them. Forty per cent. of the diamonds discovered are supposed to be lost in this way. The sides fall in from the strain of so much weight on the brink. A company working the mine systematically, with a couple of steam engines, could produce the same results with a tenth of the labour, and so obviously is the interest of the claim-owners in making the change, that if left to themselves they would form into a company to-morrow. The Government, however, forbids it ; for the natural reason that the vagabond population, the army of gamblers, keepers of saloons and drink shops, would disappear ; a single magistrate would then suffice for peace and order, and the Governor and his staff and the £100,000 a year which is now raised and spent out of the produce of the pit, would disappear together."

A more recent writer describes the Koppe diamond mine as follows :—"Fancy two hundred cabs or Cape carts running to and fro in Kimberley, which was five years ago a desert ; a large theatre, where they are now acting Shakespeare's plays ; and two churches, well attended, in which the rolling peals of the organ are heard ! But the great wonder is the 'Koppie' (diamond mine). The first discernible glimpse of the 'Koppie' is obtained from Rothschild's mart (they are the largest auctioneers on the fields), which appears to be surrounded by clusters of scaffolding poles. On nearing the busy scene I was met by a continuous stream of carts laden with the blue stuff, as it is called, in which nature has deposited those glittering and precious gems. A few minutes after I stood on the brink, gazing with wonder and deep interest into the busy vortex beneath, where, at a depth of from 200 to 270 feet 'could be seen a multitude of Kaffirs at work. On the north and south sides, at the top, in a serried row, are the

'whins,' worked by horses and steam machinery, to which are connected the wire tramways which are fixed at the bottom of the mine, while trucks and buckets unceasingly ascend and descend along them. On arriving at the platform, on the edge of which a rod, hooked on to the trucks, self-acting, deposits its contents, and at the bottom, as soon as the trucks are filled, a bell is pulled, when at once the machinery is set going. The number of these iron wire lines upon which the trucks travel is all but innumerable, and resemble greatly the films of a spider's web. Your impression when first looking at the mine is that it is nearly round ; but its form is oblong, narrowing at the bottom like a funnel, but more gradually. Below the ground is parcelled off into apparently small blocks. At present a great many of the claims near the reef are covered, through its having given way. This, so soon as the mining board get their powerful machinery at work, will soon be remedied. On looking at the immense basin, and remembering that the whole of the ground excavated has been removed by buckets, you can then feebly recognise what an enormous amount of labour has been expended upon it. At six o'clock p.m., the bells at some of the engine-houses ring, giving out the welcome summons that the work of the day is finished ; a few minutes after which, dense lines, like ants, appear clambering up the steep sides of the mine. These streams of human life continue for nearly an hour, and it's only then that an outsider can form an idea of the number of hands employed,—about 3,000 occasionally. Whilst looking into the mine a truck appears like a large bucket, in which some venturesome diggers are seated, travelling, as it were, in mid air. After the workmen have left, the firing of the fuses for blasting commences, and a series of reports, accompanied by showers of debris, like miniature volcanoes, is the result. The blue stuff, after reaching the platform, is taken away to the washing ground, where it lies exposed to the sun, and after being watered, crumbles to pieces ; and it is then

passed through sieves, and thrown into an iron cylinder about fourteen inches deep, in which a wooden frame with iron spikes revolves. Water is then let in, the mud running out some four or six inches from the bottom, the diamonds and stones falling to the bottom, which are subsequently taken out and sorted, whilst the mud is removed by an elevator, consisting of a continuous

chain of buckets, from which it is deposited, and becomes in time a mound of *débris*. Such is Kimberley mine, and the process of diamond mining and washing. The scene is a lively and busy one, accompanied by the incessant whirl of running trucks, noise of engines, and hum of human voices. I could give you much more interesting news about the fields, but time forbids."

THE BAMBOO.



It has been well said, that "amidst the many gifts of Providence to a tropical region, the bamboo is perhaps the most benignant, appropriate, and accessible." From its first existence to its decay, this plant never ceases to furnish something useful to man. Every part of it is useful, of whatever species it may be. It is said that the numerous mines of the vast empire of China are of less value to the Chinese than the precious bamboo. Rich and poor neighbours all alike benefit in some way or other from it.

The bamboo is a native of the warm climates of the East, where it grows wild. It oftentimes rises to the height of sixty or eighty feet, with a hollow stem, shining as if varnished. Little stalks, with narrow-pointed leaves, spring from the joints, and give it a graceful, feathery appearance as it waves in the wind. It sometimes grows three or four inches in a single day. Persons who have closely watched it say that they have seen it rise twenty feet, and as thick as a man's wrist, in five or six weeks; it has been known to reach thirty feet in six months.

As soon as the young shoots appear, the bamboo begins its life of usefulness. The soft juicy shoots are cooked in various ways, and used as food. Many of the poorer

classes live upon it in times of scarcity. It is recorded in Chinese history that its seed has preserved the lives of thousands. As the plant grows older a sweet juice gradually collects in the hollow joints, affording a very pleasant drink. If allowed to remain in the reed, this juice becomes solid, and from it is formed a kind of glass, said to be indestructible by fire. Other parts of the bamboo—as the leaves, buds, bark, and roots—are used as medicine.

Upon bamboo rafts the Siamese love to build their floating houses, and, as the fancy seizes them, they move from one spot to another, without inconvenience or expense. From the bamboo the same people extract what are in their ears dulcet notes, with an organ constructed of nine or more young bamboos, thoroughly drilled and bound together by an ebony mouthpiece, by blowing through which chords equal in volume of sound to many church organs may be produced. The carpenter uses the stem as posts and supports; split up, it serves for floors and rafters, or as lattice-work for the sides of rooms, while the leaves form the thatching for the roof. The shipwright forms the hull of his vessel from the stem of one species, which is easily split into planks, while smaller plants supply the masts and yards; ships with masts, sails, rigging, and cables complete are fitted for sea from the wonderful bamboo.

The farmer uses the bamboo for his fences, windmills, water-pipes, and wheels,

ploughs, carts, wheelbarrows, spades, and all other agricultural implements; his wife's furniture, baskets, and numberless articles for domestic use, and his children's toys are all made from the same plant. It is also manufactured into umbrellas, hats, musical instruments, cups, brooms, soles of shoes, sedan chairs, and wicks of candles. The bark, bruised and steeped, is formed into a pulp from which paper is made; and in some parts of Asia a certain species supplies writing pens. Its fine fibre is made into twine; its shavings form stuffing for pillows, and its leaves are employed as a kind of cloak for wet weather. From the bamboo the fisherman makes his boat, with sails and oars complete; his ropes, floats, basket-cages, and other articles used in fishing. From it the hunter obtains his bows, arrows, spears, and other weapons.

In the jungles of India tigers and other wild beasts are captured in a curious manner by the help of the bamboo. When hard pressed by hunger the savage animals leave their haunts in the forests and jungles, and stealthily prowl about the villages, carrying off fowls, sheep, and sometimes even human beings. The enraged villagers meet in a suitable place, and choosing a strong young bamboo, they bend its stoutest and tallest branches, and bury the ends many feet in the ground. A kid or a bird is fastened amongst the leaves, close by a slip noose of stout rope. The hungry beast, attracted by the cries of the decoy, rushes into the snare; the noose tightens round its throat, and in its struggles to escape, loosens the buried branches, which swing aloft with mighty force, carrying up into the air the savage thief, who is there left to swing until its cries attract the watchers.

We cannot describe half the purposes to which the bamboo is applied. Indeed, it would be nearly as difficult to say what it is *not* used for as for what it is.

In the province of Chag-Kiang, China, there are whole forests of bamboo, while that of Shantung is celebrated for the small,

hard sort, which is excellent for poles and levers. The plant is floated down in large quantities to Canton from Fo-Kien, Kiang-si, and especially Nam-hoo-foo.

In every farm, whether large or small, there is behind the house a plot of ground of about 100 square yards, surrounded with a wide ditch filled with water, and entirely devoted to the cultivation of bamboo for domestic purposes. The grove thus formed generally becomes the favourite resort of turtle-doves, usually grey, with rose-coloured claws. In their large gardens the Chinese often intersperse black bamboos with artificial rocks, producing a charming effect. In every village there are two or more bamboo stores, where the reed is sorted according to size and thickness. To work it, it should be taken in its green state; for a clever hand will then split it lengthwise into thin laths, which may be plaited in a thousand ways. As it never breaks, but only bends, and is never attacked by either worms or putrefaction, it is used for bridges over small streams; and for water-pipes for the irrigation of the small bits of ground Chinese intrepidity has cultivated, even in the least accessible places. The fisherman builds his hut on piles of strong bamboo driven into the bed of the river. The net with which he catches his fish, the hat he has on his head, the coat on his back, are all of bamboo; so is the *yolo*, or oar of his boat; so also the mat stretched over the heads of his passengers to protect them from the sun. The masts, yards, sails, and cordage of a junk are of the same valuable material. They also make paper of it, by reducing its scrapings, when clean, to a process of maceration, and then mixing the pulp with isinglass. The bamboo is in universal demand in the houses, in the fields, on water, and on land, in peace and in war. Through life the Chinaman is almost dependent upon it for support; nor does it leave him until it carries him to his last resting-place on the hill-side, and even then it waves over and marks his tomb.



SANDSTORM IN THE BEJUDAH STEPPE AT THE WELL OF EL HEJELIG.

A SANDSTORM.



SANDSTORMS in the deserts of the East are not infrequent. These storms are not, as is commonly supposed, caused by an immense mass of sand blown violently across the country. On the contrary, the sand itself is hardly perceptible to the sight; but it is there nevertheless, and persons exposed to its influence are liable to be suffocated by its baleful influence. Our engraving represents one of these visitations in the desert of El Bejudah. Says the narrator:—

"We had arrived safely at our halting-place, the well of El Hejelig, and, overcome with thirst and fatigue, I was sitting quietly in the tent, and thinking of nought but the delicious shade and repose, when the cries of my servants, and an ominous noise in the air, made me rush quickly out. I was met by a staggering wind and a blinding shower of sand, which filled my mouth and eyes, causing excruciating pain. After the first shock I turned myself about, and saw two of my servants engaged in endeavouring to secure the tent, the pole of which, firmly fixed in the earth, had snapped like a reed. Ali, my personal attendant, was displaying unwonted agility in the pursuit of a sheet which he had thrown over our stores, and which was careering skyward at a tremendous pace. After a momentary struggle, the hold of my men upon the tent was given up, and it too disappeared, leaving us shelterless. Such are the inconveniences of desert life."

Far more terrible than such a storm as this is the dread sirocco, the wind that has for ever continued to blow over the desert, carrying with it the fine particles of sand which, by the continued action of centuries, has buried the monuments, the temples, and the cities of Egypt; the sirocco, always

disagreeable and dangerous, and sometimes awfully fatal. Stephens, the American traveller, was overtaken by a sirocco in the desert outside Cairo:—

"Fortunately for me (he says) it was blowing upon my back; but still it was necessary to draw my Arab cloak close over my head; and even then the particles of sand found their way within, so that my eyes were soon filled with them, to my no small annoyance. This was very far from being one of the worst siroccos; but the sun was obscured, the atmosphere was a perfect cloud of sand, and the tracks were so completely obliterated, that a little after midday we were obliged to stop and take shelter under the lee of a hillock of sand. Occasionally we had met caravans coming upon us through the thick clouds of sand, the Arabs riding with their heads sheltered by the heads of their camels, and their faces covered, so that not a feature could be seen.

By the third morning the wind had somewhat abated, but the sand had become so scattered that not a single track could be seen. I was forcibly reminded of a circumstance related to me by Mr. Waghorn. A short time before I met him at Cairo, in making a hurried march from Suez, with an Arab unaccustomed to the desert, he encamped about midday, and, starting two hours before daylight, continued travelling, half asleep, upon his dromedary, until it happened to strike him that the sun had risen in the wrong place, and was then shining in his face instead of warming his back: he had been more than three hours retracing his steps to Suez! If I had been alone this morning, I might very easily have fallen into the same or a worse error. The prospect before me was precisely the same, turn which way I would; and, if I had been left to myself, I might have wandered as long as the children of Israel in search of the Promised Land."

JOHN KITTO.



NOT many lives have been more remarkable than that of John Kitto, whose example, like that, in another walk of life, of George Stephenson, may be held out as a beacon of hope to all industrious and enterprising men, who by imitating their industry, energy, and honesty, may leave behind them names for their children to revere, and for posterity to honour.

John Kitto was born December 4th, 1804; and, at the age of four years, was taken under the charge of his maternal grandmother, to whom he became very much attached. As soon as he learned to read, he became eager to possess himself of books. Every penny that came into his possession was employed in purchasing the story-books which then formed the attractions of the windows in the shops of small booksellers. He also illustrated with rude drawings some little books of his own, colouring his drawings with the indigo his grandmother used in washing.

About the same time he learnt to write and made indexes to his books. His first effort at authorship was made before he left school.

During these years the child was happy; but in 1814 his grandmother lost her little property, and John returned to his father's, where his time was spent in nursing the children at home, to ease the household duties of his mother; or in assisting his father in his work as a mason. In 1815 he was placed as an apprentice with a barber, whose adventures rivalled those of Baron Munchausen. He did not remain long in this situation, and again returned to carry the hod for his father. When thirteen years of age, he was one after-

noon taking a hodful of slates up a ladder, when he fell from a height of thirty-five feet, into a court beneath. He was taken up insensible, and conveyed home, where he long lingered between life and death; and when he was able to recognise what was passing around him, he found he was deaf, in which state he remained to the end of his life.

When convalescent, he was not able to resume his former occupation. His love of knowledge still remained; and to enable him to obtain a few pence with which to procure books, he accompanied the lads who used to wade in Sutton Pool, to collect the pieces of rope, yarn, iron, and other nautical fragments which found their way there. Laming himself by treading on a broken bottle, he next painted pictures, and, after a time, he procured a "standing" in Plymouth fair, where he endeavoured to dispose of his artistic productions. Thus he went on, sinking lower and lower till he became "pinched with hunger, shivering in rags, and crawling about with exposed and bleeding feet." He had not been unobserved by some who pitied him. They thought he would be better in the workhouse, and procured an order for his admission. The boy himself loved liberty, and had to be allured into the house by stratagem.

His residence in the workhouse and an apprenticeship with a man named Bowden, a shoemaker, whose harshness and cruelty induced the magistrates to cancel his indentures, extended over nearly four years. During that time he learnt to make list shoes; and appears to have been very industrious. He kept what he calls *A Workhouse Journal*, and his good conduct attracted the notice of the governor, who lent him books, chiefly directing his attention to the Bible and religious works; and, after a time, he proposed that he

should write a course of lectures to deliver to the boys. "What!" he soliloquised, after this proposal was made to him, "I, John Kitto, to write lectures to be read to the boys! Mr. Burnard seems to think me competent to it, too!" His greatest trial while in the house was the loss of his grandmother.

Better days were in store for him. Some essays that he had sent to the *Plymouth Weekly Journal* excited the attention of Mr. Harvey, an eminent mathematician of the town, who procured for him the post of sub-librarian to the Plymouth Public Library. At this time he commenced studying Latin, and also thought of "possessing himself of Greek," of which he ultimately acquired a competent knowledge.

Various schemes were now formed for his benefit. His own inclination pointed strongly to a missionary life. Before any conclusion was arrived at, Mr. Groves, a dentist, of Exeter, having seen some letters which Kitto had sent to the editor of the *Western Luminary*, made an offer to instruct him in the profession of a dentist. His offer was accepted, and Kitto removed to Exeter in 1824, where, in the spring of 1825, his first publication—*Essays and Letters*, by John Kitto—appeared, being patronised by a list of above 400 subscribers. Soon after, Mr. Groves obtained for Kitto admission to the Church Missionary College at Islington, for the purpose of learning the art of printing, that he might "take part as a printer in the great missionary enterprise." Mr. Groves undertook to pay £50 per annum towards his expenses; and the deaf *littérateur*, having been already a barber, bricklayer, shoemaker, and dentist, was now to add another profession to his list. He removed to Islington in July, 1825; and eagerly endeavoured to learn the occupation of a compositor, under Mr. Watts, who was then at the head of the printing-office of the Church Missionary Society. In June, 1827, he went out to Malta, as one of the Society's printers. Two years later, when

he returned to England, he found that a lady to whom he had been engaged to be married had proved faithless, and had married another. The intelligence of this event, received at Malta, caused him to keep his room for two days. He never saw the lady again. She died shortly after his return, expressing her regret for the wrong she had done him.

Kitto had for many years longed to engage in missionary enterprise. "I had even thought," he says, "of plans to enable me to visit Asia, and the ground consecrated by the steps of the Saviour! Even now, notwithstanding my deafness, it would not be impracticable, if some kind gentleman, on his travels, would permit me to be his (though not expert) faithful servant." His wish was met in a way which he did not expect. Mr. Groves asked him to join in his enterprise, and that, not as his servant, but as tutor to his sons. He consented; and on the 10th of June, 1829, the party left England for Bagdad, *via* St. Petersburg; arriving at the former city on the 6th of December. At Bagdad, Mr. Kitto and his friends encountered the horrors of an inundation, a pestilence (of which Mrs. Groves died), and a siege, after which time passed more pleasantly; and during the years that he resided there, Mr. Kitto made marked progress, both in spiritual and temporal learning. He left Mr. Groves and Bagdad on the 19th of September, 1832, and returned to England by Trebizond, visiting Hamadan, Teheran, Erzeroum, and other Eastern cities, and everywhere adding to his store of information, especially directing his inquiries to Biblical antiquities. Soon after his arrival in this country, he became a contributor to the *Penny Magazine*, published by the Society for Diffusing Useful Knowledge. This engagement was followed by his marriage. On the voyage home, Mr. Shepherd, a fellow-passenger, died. This gentleman was to have been married, had he reached England, to a Miss Fenwick. It was necessary, in order to execute a commission from Mr. Shepherd, that Mr.

Kitto should see this lady; and the interview led to an intimacy. Ultimately they were married, on the 21st of September, 1833. They took up their residence in Islington; and the union proved a happy one in every sense.

Thus far the life of Mr. Kitto had been one of severe trial, sorrow, privations, and change. For a few years subsequently he enjoyed repose, happiness, and quiet, constant home labour. The history of the twenty years after his marriage is little more than a history of his works. His connection with the Useful Knowledge Society led to one with Mr. Charles Knight, who entrusted to him certain portions of the *Penny Cyclopædia*. His engagements, however, did not satisfy him; he longed for some medium through which he could place before the public the knowledge he had made it his business especially to acquire; and he found it at last in the *Pictorial Bible*. This work was commenced at the end of 1835, and was completed in May, 1838. How well he discharged his duties is best evinced by the popularity of the work.*

The *Pictorial Bible* was followed by numerous other works, issued by various publishers, which required deep thought and close application. His hours of employment were frequently from 4 and 5 a.m. till 9 and 10 at night; with intervals of domestic enjoyment certainly with his family, but with none of those recreations which we think are necessary to prevent the health of the literary man from entirely succumbing. But though he lived retired, he was not unnoticed. In 1844 the University of Giessen conferred upon him the degree of Doctor in Divinity. The same year the Society of Antiquaries admitted him a member. In 1850 a pension of

£100 per annum was conferred upon him, from the Royal Literary Fund; and in 1853, when he was fast sinking under disease, £1,800 were subscribed for his aid, of which about £600 were expended before his death; and £1,200 have been invested for the benefit of his widow and two surviving children, the eldest and youngest dying before their father. That father, having completed his last work, left England, with his wife and family, in August, 1854, in search of that health which was never more to return to him. He fixed his abode at Cannstatt, in Württemberg. There, on the 25th of November, Dr. Kitto expired; and there he is interred, a neat monument to his memory having been erected over his grave by his friend, and the publisher of his last work, Mr. Oliphant.

Such is a brief record of the life of one of the most remarkable "Men of our Time"—one who owed little to education, much to himself, aided and upheld by that Divine help on which, from his earliest years, he appears implicitly to have relied. In the words of his biographer, "In whatever aspect we view him he is a wonder. It is a wonder that he rose in life at all, a wonder that he acquired so much; and that he wrote so much is yet a higher wonder." There is no one, however discouraging the circumstances in which he may be placed, to whom his example does not hold out strong encouragement, and an inducement not to despair; for, in his own words, his life evidently proves "that there is no one so low but that he may rise, no condition so cast down as to be really hopeless, and no privation which need of itself shut out any man from the paths of honourable exertion, or from the hope of usefulness in life."

* We may here say, as an instance of the popularity of Dr. Kitto's works, that of one edition of his Bible (the "Pictorial Family Bible") the present publisher boasts of a sale of 100,000 copies, and, from our knowledge of its usefulness, we readily concede the assertion.



THE SHIP OF THE DESERT.

Of all animals the camel is perhaps the most uncouth in shape and farthest from our idea of symmetry and beauty; and yet the most superficial observer cannot but be struck with the exquisite manner in which the creature has been endowed with the qualities needful for the peculiar circumstances amid which it dwells. In the sandy wastes there are few landmarks, but with a long neck like an ostrich its line of vision stretches afar. Its eye projects, and surveys the horizon, and detects the well or prickly shrub when far from human view; while the heavy brow overhangs the eyeball, shielding it from the direct glare of the sun in a burning sky. The fine particles of sand with which the air of the desert is loaded would to animals with wide and open nostrils occasion the greatest suffering; but the nostrils of the camel are in the form of slits, which it can close or open at will, and are provided with a fringe of long hairs. The foot is divided into two toes, each having a horny tip; an elastic pad or cushion, constituting the main part upon which the pressure falls, spreads broadly beneath, connecting them together, but leaving the points free. On pressing the ground the elastic cushion expands, and the toes diverge, enabling the creature to tread over the yielding desert or the hard and arid plain with almost equal comfort. The large incisor teeth are admirably adapted for cropping the tough and prickly herbage of the desert; while in the humps of its back and the cells of its stomach it has a reserve of nutrition which enables it to travel for several days without food or drink. According to Dr. Robinson, the ordinary speed of the burden camel is from two to three miles an

hour; but the pace of the dromedary is from five to six. Burckhardt relates an instance in which a camel carried its rider one hundred and fifteen miles in eleven hours; and Colonel Chesney, of the British army, rode from Basrah to Damascus, a distance of nine hundred and sixty miles, in nineteen days and four hours, averaging fifty miles a day, the animals getting no food but such as they gathered for themselves during the halts of the party.

An important religious ceremony, called the Festival of the Bukra Eade, was at one time held annually by the Mahomedans in Delhi. In commemoration of Abraham's sacrifice of his son a camel was slaughtered by the king. With great pomp the monarch, surrounded by his nobles, rode from the palace to the Eade gate. After the customary devotions the camel was tightly bound, and the king with a sharp spear pierced the poor brute and caused its instant death. He then retired with his court to a large tent, and when all were solemnly arranged in their places, his majesty presented to each assembled guest a piece of fried camel's flesh, which was received and eaten in silence in honour of Abraham's memorable sacrifice.

This striking observance is exceedingly interesting to the Bible student. We see in it a reflected proof of the historic credibility of the Bible. It testifies to the existence of Abraham; while, without an uninterrupted tradition among the Arab tribes of that patriarch's extraordinary act of self-denial and submission to God, it would seem impossible that the ceremony here described could ever have become incorporated with the Mahomedan faith.

It is difficult to conceive how the affairs of mankind could be carried on in the regions inhabited by camels without their assistance. To a very considerable extent the inhabited and settled parts of eastern

countries are separated by deserts extending for hundreds of miles, with only here and there a few prickly bean-caper shrubs (*Zygophyllum*), and hardly a blade of grass to relieve the eye—nothing but barren rocks and burning sands—intervals, therefore, as impassable as though the sea rolled its waves between them. Some special means must be provided, and accordingly, an animal is found there which answers every purpose; the camel, well named by the Arabs the “ship of the desert,” as no other animal can cross these wastes and live. He alone possesses those powers of endurance necessary for such a journey. The coarse, prickly shrubs growing there are to him the most delicious food, and even of these he eats but little. There is a great scarcity of water in the desert, and he can travel several days without it; because, when he has a chance of quenching his thirst, he always provides for such emergencies by storing away a quantity in his stomach. He thus carries his own spring when travelling in countries without one, from which he draws at pleasure as much as he requires. The foot of the camel is broad and cushion-like, beautifully formed so as to ensure him ease and comfort in his tread; he is thus enabled to walk without fatigue over the yielding sands and hard gravelly soils of the desert, even when heavily loaded.

The load of the camel varies from 600 to 1000 lbs., according to his strength and the distance which he has to go. These animals are taught from infancy to kneel down to receive their load or their rider, and consequently the joints of their legs and their breast, by coming into frequent contact with the ground, acquire in course of time remarkable callosities. Kneeling is also their natural posture when in a state of repose, their legs being flexed beneath the body, and their breasts resting upon the ground. When overloaded, the camel testifies against the injustice by

loud cries, and obstinately refuses to rise, even when severely beaten. It would seem that the poor animal does not find much mercy under such circumstances; that he is frequently treated most inhumanly by his driver; and that heavy galling loads and meagre fare are most frequently his appointed portion.

But even the fare of the desert, scanty as it is, may fail; and when this is the case, the hump, which strikes the eye as a deformity, becomes very valuable. It is, in fact, a reservoir of nutriment, and its fatty mass is gradually absorbed into the system, which thus receives the nourishment which is denied around. When the hump disappears, rest and plenty of good food are absolutely necessary to restore it to its former size, which does not take place till the other parts of the body of the camel have been well replenished. Before commencing a journey, therefore, particular attention is paid to the state of the hump; for, until this is in a satisfactory state, the camel driver well knows that the animal is not in good travelling condition. When in harbour, therefore, and undergoing repairs, this living Arab ship is liberally stored with food, and brought again into sailing order as speedily as possible. The camel is daily fed with balls of barley-meal mixed with powdered dates, made into a sort of paste, which food, even after the voyage is resumed, is also given at every halting-place, so long as the supply lasts.

The gentle disposition and sweet temper of the camel is quite as imaginary as its speed; for the creature is truly an ill-conditioned and morose beast, ever apt to bite, and so combative as to engage in terrible conflicts with its own species as soon as it is relieved of its load. Taking advantage of this disposition, the native chiefs will often amuse themselves by combats between fighting camels, which are trained for the purpose, like the fighting tigers and buffaloes of India.



THE FISH TORPEDO.

THE general arrangement of the "Whitehead" "fish" torpedo, the latest and most extraordinary weapon of naval warfare, may be described in a few words. It is a long cigar-shaped case of thin steel, built in sections well screwed together. Those recently on view at Woolwich Arsenal were about 17 feet

long from end to end, and each section was 15 inches wide in its widest part, and the steel about a sixteenth in thickness. The first compartment, at the head, contains the charge of gun-cotton, to be fired by the forcing of a roughened pin into a cap of fulminate, on the torpedo coming into contact with anything after it has been set in motion. The second compartment contains

Mr. Whitehead's great secret contrivance, which gives the operator control over the machine, so that he can make it run at any required depth under water. The next section of the torpedo is the reservoir for compressed air, the motive power by which it runs along under water; then comes the machinery; and last of all the screw and rudders. The screw is four-bladed, in appearance exactly like that of a steamer; but of the rudders there are two, one placed horizontally and the other vertically. It is the horizontal rudder which submerges the torpedo and keeps it at the required depth until, its force being spent, it rises to the surface or sinks to the bottom, as may have been arranged in the manufacture. Outside the case nothing is to be seen but a smooth, polished surface, with a small trigger on the upper part of the air-chamber, and a few screws recessed for the reception of keys. One of these, at the side of the second section, has an index attached, marked in feet, and this has merely to be turned to the required number for setting the torpedo to submerge itself and proceed along at the depth indicated. The trigger above mentioned is merely a lever for opening the air-valve; and this is either done by hand when the torpedo is merely launched from a boat, or it is drawn back by a catch at the muzzle when it is shot out of a tube. In order to prevent accidents there are two safety-pins, which will not allow the fuse to act. The one is drawn at starting, but the other can be so arranged as to remain in its place until a certain number of revolutions of the screw have been made, by which the torpedo is carried to a safe distance.

The preparation and use of the Whitehead fish torpedo on board ship may now be described. The sections of the torpedo are put together below, outside the torpedo-room, and it is run along the flats on a small truck until it is beneath a hatchway in nearly the centre of the battery deck, or citadel; through this it is hoisted by means of tackles, and placed in a light iron framework carriage, in which it is run from the hatchway

to the torpedo-tube; here the carriage is placed so that the nose of the torpedo is pointing into the tube, and the tail is close to the torpedo-charging column. The torpedo crew consists of six men, No. 6 being stationed at the torpedo magazine below, the remaining five men with the torpedo. Now, the torpedo being in its place, it is charged with compressed air by means of a small copper pipe, one end being screwed to the charging column, the other to a small hole in the left side of the torpedo, No. 1 of the torpedo crew opening the valves in the charging-column to admit 750 lb. of compressed air; this is the amount usually used for practice, 1000 lb. to 1200 lb. being the amount that the torpedo would be charged with for actual warfare. On the gauge showing 750 lb. No. 1 shuts off his valves and unscrews the charging-pipe, and then proceeds to set the wheel for the number of teeth ordered by the officer, the little wheel in the stern regulating the distance the "fish" is required to go, as it runs forty yards for every tooth. This wheel also pulls out a safety wedge when the torpedo has gone eighty yards from the ship. The depth having been set, and the amount of pressure in atmosphere for the required speed (which works up to twelve knots and a half an hour), the pistol, or firing apparatus, is screwed in, the safety-pin is withdrawn, and the torpedo is run into the tube. The impulse tube is then put on, and the torpedo is reported, through a tube to the pilot tower, to be ready for firing. The impulse tube is an affair very much resembling a telescope in form, which is forced out by compressed air, and, pushing the tail of the fish, gives it a good start on its journey clear of the ship, the compressed air afterwards forcing the telescope in again. As the torpedo is forced out, a small projection on the top of the inside of the tube catches a small lever on the top of the torpedo, and throws it back. This action opens the air-valve, and admits the air from the air-chamber to the engines, and so sets the screws going.

For practice, a boat is sent out about

200 or 300 yards from the ship, either to pull past her or remain stationary, and a shot is taken at the boat, the torpedo being set to a sufficient depth to pass under her. The effectiveness of the shot requires at present very good judgment on the part of the officer firing the torpedo; but when Commander Wilson's torpedo-director is supplied to ships generally, the correctness of the shot will be almost a certainty. When the torpedo has finished its run, it rises to and floats on the surface of the water, and the boat then attaches a line to its nose and tows it back to the ship.

Brought alongside, a pair of tongs is lowered over the side and placed over the centre of the fish, and when fairly placed the catch that keeps the tongs open is pulled up, and the tongs close firmly round the body of the fish, the safety-pin having previously been put in over the air-lever, so that, by any accident the engines should not again be started and the fish run away with its tongs.

When the tongs are firmly secured, the torpedo is pulled on board, and is either taken to pieces, or stowed away, or put together again and treated with another run.



ASCENT OF THE SACRED MOUNTAIN.

IN the year 1857, the lofty summit of Fusiyama, the sacred mountain of Japan, was for the first time trod by European footsteps. Mr. E. B. De Fonblanque, one of the adventurous explorers, gives the following account of the ascent:—

“Mr. Alcock, our envoy in Jeddo, desirous of visiting the interior of the country, and curious to ascertain the truth of all the wonderful tales related by the Japanese of their beloved and venerated mountain, having successfully disposed of the numerous insuperable obstacles most pertinaciously suggested by the Government, left Jeddo for Fusiyama on the 3rd instant.

As may be imagined, our projected pilgrimage excited no small interest among the Japanese, who, as they crowded the streets of Kanagawa to watch our departure, seemed puzzled whether most to admire our temerity or marvel at our impudence. Some of the older men shook their heads ominously, declaring that no good could come to their country from such a desecration of their gods; but the majority of the people were simply amused. They have seen and learnt so much within the last year, that nothing can surprise them.

Our route, as far as Odawara—a distance from Jeddo of about forty-five miles—was by the great highway to Nagasaki, skirting the sea. This is an admirable, broad, well-paved road, flanked on either side with gigantic cedars and vines, affording a most grateful shade from the still powerful sun. The effect of many miles of these avenues, formed of trees averaging from 150 to 180 feet in height, is very striking.

At Odawara we turned into the interior, and commenced to cross the Hahoni Mountains, a range lying between the sea and Fusiyama. Arrived at the summit after an eight hours' march, we found ourselves, at a height which we computed about 6000 feet above the sea level, on the borders of a glassy lake, six miles in length, and one and a quarter in width. Wonderful tales are related by the Japanese of this lake, which they state to be bottomless in the centre and inhabited by an evil spirit, very much given to drag unwary mortals below. It was probably from fears of our safety that no persuasion could induce our officers to procure us a boat to explore these waters.

On the following morning we commenced our descent from Hahoni, and on the evening of the next day, the sixth from our

departure, reached Muri-jama, 'a' village lying at the foot of the mountain, and about 100 miles distant from Jeddo. Here the authority of the 'Tycoon ceases, and spiritual government begins, the Holy Mountain being under the sole jurisdiction of the priesthood, two of which respectable body now attached themselves to our party, and never left us till we returned in safety to the foot of the mountain.

On the next day we rode about six miles to a place called Hashi-Mondo, where the steep ascent commences, and here, leaving our horses and equipping ourselves with pilgrims' staves, which the priests dispose of for the sum of one penny each, we girded up our loins and climbed manfully up the rugged and precipitous path, our light baggage and commissariat stores being carried by goliks, or 'men of great vigour'—a description which the appearance of these poor creatures, who earn their livelihood as beasts of burden to the pilgrims, did not by any means justify.

At every half mile *en route* a hut is erected, where pilgrims repose and are refreshed with tiny cups of tea. During our six hours' ascent, we passed nine of these resting-places, and, darkness coming on, we took up our abode in the ninth, ate a modest dinner, and, stretching our weary limbs upon straw mats, slept as well as the cold and the fleas would allow us.

We had now accomplished over two-thirds of the ascent, but the worst was yet to come. Hitherto the path, though steep and rugged, had afforded a tolerably firm foothold; but the rest of the way was over loose pieces of lava, scoria, and cinders, and at every few yards the ascent became more precipitous. It was curious to remark how some of our party, who had before shown themselves somewhat insensible to the beauties of nature, would now stop every few minutes to admire the scenery, generally seating themselves to do so; but some allowance must be made, in consideration of the rarefied state of the atmosphere, which rendered violent exercise somewhat difficult, and made some of us gasp very painfully. At

first we met with little snow; but as we advanced we found large patches here and there; and on reaching the summit, after four hours' toil, the tubs of water near the temple were frozen into a compact mass. Still, the cold was not anything like what we had been led to suppose it would be, the thermometer at midday showing only 38 degrees in the shade, and boiling at 182.

The temple of Fusi-yama is a most modest unpretending little hut, adorned with a few gods in lava, and some common tinsel ornaments. Here the devout lay their offerings upon the altar, and in return have their garments stamped with strange figures and devices, in token of their having accomplished their pilgrimage. Great virtue is attached to these stamps, particularly for the cure of cutaneous diseases, and their number is only limited by the size of the garment and the extent of the sec. I invested an entire uzeboo (1s. 6d.), and received the impress of all the gods, and (unless likenesses are very deceptive) of all the devils too, of Fusi-yama.

Having visited the temple, we proceeded to the highest point of the crater; here Mr. Alcock's standard-bearer unfurled the British flag, while we fired a royal salute in its honour, his Excellency setting the example by discharging the five barrels of his revolver into the crater, and the rest following, till twenty-one guns had been fired. We then gave three cheers, sang 'God save the Queen,' and finished by drinking the 'health of her gracious Majesty' in champagne, iced in the snows of Fusi-yama, to the utter amazement of the Japanese, who had never before seen such startling religious ceremonies.

The crater of Fusi-yama is between two and three miles in circumference, and about 600 yards in depth, and the highest point is something more than 14,000 feet above the sea. The Japanese have generally allowed 17,000. There has been no eruption for three centuries.

We were fortunate enough to have a fine, clear, sunny day for the ascent, and, as we

looked below and around us, there lay the fair land of Japan like a highly coloured map, the points of its headlands jutting sharply into the blue sea; range upon range of mountains stretching across the full length of the island as far as the eye could reach, and rivers winding through green valleys, gradually increasing in size till they empty themselves into the sea. Had our journey been as disagreeable as it was the reverse, that one view would have richly repaid us for our toil. Well may the Japanese be proud of their beautiful Fusiyama.

The descent was comparatively easy, and of course every one of us said, at least

once, *Facilis descensus*, etc., as we turned homewards, by a new and if possible finer route, till on the 15th we reached Etamé, a picturesque village on the sea shore, celebrated for its sulphur springs, whence I returned to Kanagawa by water, leaving Mr. Alcock and some of his party to take the baths.

Never did a party more enjoy themselves than the eight Englishmen who were the first to make the ascent of Fusiyama, and we returned to our posts more than ever impressed with the marvellous beauty of this land, and the kindliness and happiness of its people."

LOST WILLS.



SEVERAL well authenticated instances prove that the exhumation of the body of a Bedfordshire clergyman, which caused such excitement, for the purpose of ascertaining whether an alleged missing will was concealed in the coffin, was not an unprecedented incident, one of the most recent occurring in the colony of New

South Wales, when a small packet of old love-letters was found in place of what the relatives now believe to be an imaginary document. If we may accept the testimony of several leading undertakers in this country, the practice of depositing long-treasured missives of affection in the last resting-place of the deceased owner is more general than most people imagine; but the fulfilment of the wishes of the departed has its inconveniences, and even dangers, for in the event of the non-discovery of a will alleged to be in existence, the supposition that it has been interred with the remains of the testator invariably obtains general credence. So far back as the middle of the

last century a correspondent of one of the monthly magazines, which then formed the real newspapers of the greater portion of the community, pointing out the possible complications and heavy loss to which innocent individuals might be exposed from a possible abuse of the system, proposed to make it illegal to deposit any documents, no matter of what description, in a coffin without first submitting the same to the inspection of the officiating minister or some other authorised functionary, who should furnish a certificate of the same on payment of a small fee. In illustration of the necessity which existed for some such precaution, he related the case of a Yorkshire gentleman who, having inherited a distant valuable property, was occasioned much annoyance and expense in consequence of a disappointed relation maliciously circulating a groundless report that a will, bequeathing the whole of the property to the use of the poor of the district, had been buried with the corpse of the testator.

Very few testamentary documents have, however, been found thus concealed, for a coffin forms a somewhat insecure depository for such papers, especially when affecting

the ownership of valuable estates, and where there exists a desire to get rid of an obnoxious will, the fireplace furnishes the easiest and most effectual means of so doing. The number of wills thus surreptitiously destroyed is probably not large, a considerable percentage of missing wills being traceable to accident, neglect, or over-caution on the part of those making them.

There is a story of a Lincolnshire gentleman who came up to town for the purpose of consulting a solicitor relative to preparing a will. The document was duly drawn up, witnessed, and signed, and the testator prepared to return home. Before he could leave London he was taken ill, and being fearful of mislaying the paper, he placed it in a small travelling bag which lay upon the table. Feeling better the next morning, he proceeded on his journey, but had scarcely entered his house when his illness returned, and in a few hours he found himself at the point of death. Calling his family around him, he told them the object of his journey to London, and bade them open the bag in which he had deposited the will. They complied with his request, but no document was to be found. He was thunderstruck, and told them that it must have been left at the inn where he had been staying while in London. After his death the legal representative of the family proceeded to town, and instituted a rigorous search for the missing will. It was not to be found, and the landlord was about to be given into custody on suspicion of having stolen the document, when a messenger arrived post haste from Lincolnshire with the intelligence that the will had been discovered in one of the pockets of the deceased man's travelling coat, having apparently been placed there in a moment of forgetfulness.

In another case the testator, who was notorious for his careless habits, neglected to place his will in a place of security, allowing it to remain among the loose

papers and pamphlets in his study. After his death the will could not be found, and the various members of the family were commencing law proceedings for the enforcement of their respective claims, when it was ascertained that the testator had disposed of a quantity of newspapers shortly before his decease. After considerable difficulty the purchaser was traced, but in the meantime he had disposed of the paper to several retail customers. These were hunted up, and among the scraps discovered in their possession were found several pieces of paper, which, when joined together, proved to be the missing will.

But over-caution frequently occasions inconveniences fully as great as those produced by carelessness. In one of the Midland counties a wealthy solicitor deposited his will in a cash-box, which he kept in a large safe in his private office. Every week he carefully examined the box for the purpose of ascertaining whether the document was in its place. After a long illness, during which he had frequently requested his confidential servant to inspect the inside of the safe, and assure himself that the cash-box had not been removed, he told his wife of the existence of the will, but when the funeral was over it was found that the cash-box had disappeared. Two or three months afterwards it was discovered in the bed of a pond which had become suddenly dried up. Subsequent inquiries elicited the fact that the safe had been opened by means of false keys by one of the junior clerks, who had supposed from the caution displayed with respect to the contents of the cash-box that they were of a highly valuable character. On becoming aware of his mistake, he, in a paroxysm of mortification and alarm, threw the box into the place where it lay securely hidden until the receding water revealed it to the gaze of those who had given up the missing receptacle and its contents as lost.

A SILVER MINE IN JAPAN.



AT Ikuno, Japan, are large silver mines, where European machinery has been introduced with great success. On the hill-side above the works, the objects which first attract the visitor's notice are the house (on a small platform) of the stationary engine, used to work the shaft now being driven down into the rock. The rock is perforated in some places like large rabbit-holes; and a tramway runs round the face of the hill and connects these holes with a series of shoots, down which the ore is passed to the works. These holes turn out to be galleries (six feet by six), which already measure eight miles in length; in them is seen the process of removing the ore by blasting, the fuses for which were at first imported from abroad, but are now made on the premises, at a saving of more than seventy-five per cent. The ore is broken up into pieces at the mouths of the shoots; the least rich lumps and those containing a large amount of other minerals are set apart for consumption at convenience; while the best pieces are sorted into five classes, their estimated values ranging from about sixteen to one thousand pounds per ton. These are pounded into dust in crushing-mills, and the dust baked in ovens with common salt (chloride of sodium).

Hitherto the silver has been combined with sulphur, but in these ovens a chemical change takes place, the chlorine of the common salt combining with the silver and the ten or twelve per cent. of gold which the ore contains, and the sulphur of the silver combining with the sodium of the salt to make Epsom salt, which goes into the river and poisons the fish. The ore, now a red earth, is then, by means of water and iron balls, thoroughly mixed with a large quantity of quicksilver by the aid of revol-

ing drums. Under this process the quicksilver takes up the precious metal, and when the amalgamation is complete, the drums are emptied and the mud washed away. The combined metals are next treated by hydraulic pressure against a leather sieve, through which free mercury is extruded, leaving a putty-like brilliant white amalgam. Heated in iron retorts, the remaining mercury in the amalgam is driven off into a condenser to be used again; and the resulting lumps of metal having being fused with borax, which brings away some scoræ and other impurities in the form of scum, are run into moulds and sent to the mint at Osaka. The metal contains, in the form in which it leaves Ikuno, about seventy per cent. of silver and ten of gold, the remaining twenty per cent. being nearly pure copper. The power utilised to drive the machinery at the Ikuno mines is mainly water, which is brought four miles and a half in an artificial canal, and may be taken for nine months in the year at two hundred thousand gallons per second, with a fall of one hundred feet. During the rest of the year this water supply fails, and the works are driven by steam. The Japanese Government derives a handsome revenue from these mines, which will be greatly increased when the copper is worked independently.

Japan, indeed, from her position on "the high road of nations," promises to be in the East what the British Islands are in the West. She possesses in the bosom of her own soil those minerals and metals which give wings to trade, which is gradually linking together all the remotest parts of the earth. Her insular geographical situation, her excellent harbours, her dense and industrious population, her boundless productive resources, and vast capabilities of commerce, the superior intelligence and refinement of her princes, and the skill, energy, and enterprise of her people, entitle her to rank above every other Asiatic race.



THE FLOATING DOCK OF BERMUDA.

ONE of the most remarkable engineering constructions of our day is the floating dock of Bermuda. A dock capable of receiving large vessels of war had long been felt to be a great want in Bermuda. The porous nature of the rock hindered the construction of a stone basin in the usual way. It was at length determined by Colonel Clarke, director of works of the navy, to construct at home an iron dock, to be floated, when complete, to its destination.

The dock was commenced in August, 1866, and was finished in May, 1869, at a cost of about a quarter of a million sterling. By Midsummer day all the fittings were complete, and the strange floating monster was ready for the voyage.

As the construction of the *Bermuda* was a wonder of engineering and mechanical skill, so her conveyance was a triumph of nautical achievement. Though open at both ends, and the sides towering above the water as high as the tops of a frigate, and drawing only 11 feet 2 inches, the passage was made with complete success, and the dock was in time safely moored in Bermuda.

The *Bermuda* was fitted with a gigantic rudder, and two light wooden bridges were thrown across her for purposes of navigation; lighthouses, semaphores for signalling to her consorts by day, and flashing lanterns for night work, were supplied to her; she was also provided with steam whistles and guns in case of fog, and at each corner was fixed a lightning conductor. Her crew consisted of 82 hands, under a staff commander and other officers, and were quartered in several of the upper watertight compartments, which were fitted as cabins. As these had no ports, their ventilation was

only such as the hatchways afforded, and in hot weather the "tween decks" of the dock were almost unbearable. Her high sides were decked with wood, and afforded fair walking room, but by descending 53 feet of ladders her floor could be reached, and its clear space of 110 yards in length was a famous exercise ground.

The *Bermuda* was sent to sea without her caissons, which weigh about 400 tons, and are used to close up each end of the dock after a vessel has been received upon her floor. These, having been made and fitted in England, were conveyed in pieces to Bermuda, and there riveted together by a body of workmen sent out for that purpose by the contractor. Even without them the dock weighed 8,200 tons, and although when the wind was fair a sort of sail or curtain was set between her sides, neither this nor her ponderous rudder was found to be of much assistance. She had to trust entirely, both for towing and steering, to the engines of the men-of-war appointed to convey her to her destination. The vessels selected carried, perhaps, the most powerful machinery afloat, and, by the skilful application of competent strength, the *Bermuda* was moved through the water at an average speed of about five knots an hour.

Slipping her moorings in the Medway, she was taken in tow by six tugs, and proceeded to the rendezvous at the Nore, where the ironclads *Northumberland* and *Agincourt* were in waiting to pick her up. The *Terrible*, whose paddle-wheels have done good service in various parts of the world, steamed astern and in tow of the dock, for the double purpose of steering and of acting as a check upon her should she prove unruly. The work of attaching the dock to the *Northumberland* was quickly accomplished. She was brought under the ironclad's stern; the immense hawsers, 620 feet in length and 26 inches

in circumference, were at once passed between the vessels, and the squadron started down Channel. These hawsers were secured to the riding-bits in the cut-water deck, with which the dock had been fitted, and which formed part of the original design for rendering her navigable. This deck projected 24 feet, and was sloped away on the under side, so as to offer the least possible resistance to her progress; the after end of the dock was rounded off in a similar manner.

The squadron made its way slowly down Channel, the *Agincourt* and *Northumberland* harnessed tandem fashion, in front of the *Bermuda*, and the *Terrible* partly steaming and partly towing astern to keep the huge mass from yawing. The *Buzzard* and *Medusa*, soon afterwards relieved by the *Helicon* and *Lapwing*, took up their positions on either side, acting as a sort of police to warn off any vessels that might approach dangerously near to this strange ocean procession. Such an extraordinary vessel, if we may call her so, had never ventured on the dangers of the deep; the decks of her high sides were at about the elevation of the mizentop of the *Agincourt*, and outside the house which served as the captain's cabin was a regular flower garden, in which sweet peas, mignonette, and other common flowers flourished, giving to the place more the appearance of an Australian shanty in the bush than of anything appertaining to ship-board.

The hydrographer to the Admiralty had laid down a track which was carefully adhered to by the squadron; it was based, as was the date of sailing, on the most careful consideration of probable wind and weather, and the result showed how soundly statistical knowledge of this sort may be applied. During the whole of her voyage, which lasted thirty-six days, nothing but the finest weather was met with; all circumstances,

with good management, contributed to a prosperous conclusion, and the *Bermuda* was towed into Grassy Bay, off Ireland Island, and rode at anchor opposite the camber in which her life is to be passed. Since leaving the Medway there had been no accident to life or limb, although the clearing of the tackle often involved very dangerous service. The vessels towing her had been managed with a skill and delicacy only appreciable by those who know how much may depend in the crisis of an undertaking of this sort upon a few spokes of the wheel or turns of the screw. The last few miles were the most anxious of the whole voyage, and the currents of the Narrows, the tortuous and shallow channel, involved great risk; the ironclads drew too much water to be used here, and the *Bermuda* evinced at one time a disposition to start on her own account for Halifax, taking the *Terrible*, which was doing her best to persuade the dock to face the Narrows, in tow. However, after such a day's expenditure of tackle as has rarely been equalled in naval annals, the monster was coaxed into submission, and passed into the harbour all safe.

The only place touched at in the voyage was Porto Santo, in the Madeira group, where the *Agincourt* and *Northumberland* gave place to the *Warrior* and *Black Prince*. The highest speed ever attained was six and a half knots; but this involved a great consumption of coal, the husbanding of which was one of the chief necessities of the expedition. The senior officer was most unremitting in the careful performance of his duty; day and night, all through the voyage, flags, senaphores, and lanterns were at work, and the signalmen of the squadron had little rest; every *contretemps* was foreseen, and defeated by some new expedient, and the whole conduct of the expedition was without a single mistake.



THE BABOON.

THE baboons are easily distinguishable from the rest of the monkey tribe by their dog-like muzzle and generally ferocious aspect. There are no baboons in the New World, the race being confined to Africa and Asia, where they are very

common, and, going about in large troops, commit great devastation in the scanty crops of the native cultivators. There are several species: the chacma, pig-face baboon, or ursine baboon, is a native of South Africa; the dog-faced baboon inhabits the more

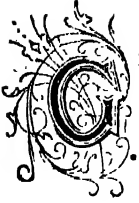
northern parts of Abyssinia, and is also found in Asia, in Arabia, and Persia. The tribe of dog-faced baboons have long tails; but Africa also boasts a race almost destitute of that appendage—a race, according to our notions of beauty, of almost appalling ugliness. Baboons, like all monkeys, are very expert at climbing, though they do not frequent trees so much as rough and stony ground; they are also more *four-footed* than many of their congeners, and are swift on level ground. “Their paces” says the Rev. Mr. Wood, “are generally of two kinds: a walk when they are at leisure and uninterrupted in their proceedings, and a gallop when they are alarmed or otherwise hurried. The walk is remarkable for its jaunty impertinence, and must be seen before it can be properly appreciated. There is an easy, undulating swagger of the whole person, and a pretentious carriage of the tail, that, aided by the quick cunning blink of the little deep-set eyes, imparts an irresistible air of effrontery to the animal. Their pace, when hurried, is a gallop, somewhat rescinding that of a dog.” Active to a degree, and furnished with powerful limbs, they are no despicable antagonists when provoked. They are of a dark brown colour, and have long hair. Their food is principally roots and fruits; it is said that they will eat scorpions, which they deprive of their stings.

The baboon was worshipped by the ancient Egyptians, and many of their preserved bodies have been found amongst the mummies. “Apes” are mentioned twice in the Scriptures, as having been brought to Solomon by the navy of Hiram (1 Kings x. 22; 2 Chron. ix. 21); and as the Israelites were acquainted with the kinds found in North Africa, Nubia, Ethiopia, and certain districts of Arabia, it is most probable that baboons were among them. Solomon was fond of studying natural history (1 Kings iv. 33), and such a striking animal as the baboon would no doubt be

added to his menagerie. Specimens are often brought to Europe, but do not usually live long, the climate being too severe. Captain Drayton gives the following graphic account of the habits of the baboon:—

“Suddenly I heard a hoarse cough, and on turning saw indistinctly in the fog a queer little old man standing near and looking at me. I instinctively cocked my gun, as the idea of bushmen and poisoned arrows flashed across my mind. The old man instantly dropped on his hands, giving another hoarse cough, that evidently told a tale of consumptive lungs; he snatched up something beside him, which seemed to leap upon his shoulders, and then he scampered up the ravine on all-fours. Before half this performance was completed, I had discovered my mistake; the little old man turned into an ursine baboon with an infant ditto, who had come down the kloof to drink. A large party of the old gentleman’s family were sitting up the ravine, and were evidently holding a debate as to the cause of my intrusion. Some of the old ladies had their olive branches in their laps, and appeared to be ‘doing their hair,’ while a patriarchal old fellow paced backwards and forwards with a fussy, important sort of look. Two or three young baboons sat close behind him watching his proceedings: sometimes with the most grotesque movements and expressions they would stand directly in his path, and hobble away only at the last moment. One daring youngster followed close on the heels of the patriarch during the whole length of his beat, and gave a sharp tug at his tail as he was about to turn. The old fellow seemed to treat it with the greatest indifference scarcely turning round at the insult. Master Impudence was about repeating the performance, when the *pater* suddenly sprang round, and catching the young one before he could escape, gave him two or three such cuffs that I could distinctly hear the screams.”

THE CATACOMBS OF ROME.



REAT interest attaches to these wonderful excavations. The following interesting account of them is given in Dr. Manning's work entitled "*Italian Pictures*":—

"In seeking for traces of the primitive church in Rome, we turn at once to those in the catacombs as being not only of the highest interest and importance, but also of unquestioned authenticity. Elsewhere we are perplexed by superstitious legends and conflicting traditions, in which it is difficult to extract the few grains of truth from the mass of error in which they are imbedded. But in the catacombs we cannot doubt that here the martyred dead were laid down to rest 'in peace,' and that the living sought refuge from persecution in these 'dens and caves of the earth.'

Concerning the construction and early history of these crypts nothing is known with certainty. Some of the classical writers allude to subterranean caverns which appear to have existed and been inhabited from a remote antiquity. Many writers on the subject consider this underground city to be the result of quarryings carried on for the sake of stone to be used in building. More accurate observation, however, seems to show that the galleries are carried through soil which could not be used for that purpose. Others regard them as pits dug out for the sake of pozzolana, a sandy volcanic material used for mortar or cement. Lastly, there are those who believe them to have been excavated for purposes of interment, and either in part or altogether to have been the work of the early Christians.

It is only with the condition of the catacombs from the commencement of our era, and principally with the story of them during the few first centuries, that we have now to do. That they were occasionally taken advantage of prior to those days for

the purposes of burial is evident from the pagan inscriptions found here and there in them; but probably the Roman world knew little of their existence, and less as to their extent. The outlaws of society, vagabonds, and thieves, hid in them, and kept the entrances secret.

The catacombs spread in almost every direction outside the walls of Rome. The passages or galleries in them crowd together in some places like the alleys and streets of a city, intersecting one another in a network of endless entanglement and confusion, so that attempting to explore without a clue you are soon effectually lost. At times so densely are they crowded together that you wonder the impending crust does not break through and bury acres of them. Again, from this congested labyrinth passages outstrip the rest, and run off singly for a mile or more, to join some distant branch. Here and there ranks of galleries are found existing one beneath another, and care must be taken, in walking through the topmost, lest, on account of the sundry holes met with where the intervening tufa has given way, the visitor do not inadvertently fall through into the regions below. The sides of all the galleries are thickly perforated with tombs, oblong horizontal niches—two, three, or even six ranks of them, one above another, from the floor to the roof, where the dead have been placed and sealed in; and they present to your eye as you walk along an appearance something similar to the sleeping-berths in a ship; or, to use the words of Abbé Gerbet, you may look upon them as the 'shelves of a vast library, where Death has arranged his works.' 'Vast' indeed the abbé may well term it, for the most experienced of archaeologists calculate the combined length of these passages at upwards of nine hundred miles, and assert that above six millions of dead were buried in them!

Perhaps the most interesting are those

known as the catacombs of St. Calixtus. The entrance is in some gardens adjoining the Appian Road, about two miles from Rome. Having lit the torches handed to us, we follow our guide, bending low through an arch in the tufa, into an oblong chamber, where a gleam of daylight struggles in through a distant opening in the top. The impressionable visitor will not enter without a feeling that he treads on hallowed ground, for there, cut in the dark grey stone, four graves confront him severally inscribed,—

FABIANVS. MAR.

ANTEROS. EPI.

LVCIVS. EPIS.

EVTICHIANVS EPIS ET MAR.

Four bishops and martyrs of Rome—of the dates A.D. 235, A.D. 236, A.D. 256, A.D. 275—are entombed in this small chapel. The other graves around lack superscriptions. On in the black darkness, in single file, through close and devious passages, where the torches of the foremost of the party are soon lost to sight, we arrive at a cubiculum; in fact, we are come to a region where they abound, for we pass many of them to the right and the left. But a visit to this one must suffice; it is about as capacious as the apse of a small church, only the vaulted roof is very low. We crowd in and bring our lights to bear on two glass cases, which the guide points out to us, wherein are laid bodies that have been taken from their graves.

And these were martyrs! so at least says our guide. Looking upwards away from this sad spectacle, we recognise, overhead, the gentle figure of the Good Shepherd painted in colours that have stood bravely under the corrosive touch of Time, and, what is more destructive in these cases, the smoke of visitors' lamps.

In the great majority of instances the graves consist of deep, oblong, shelf-like incisions in the tufa, wherein, after the lower surface had been hollowed out a little for its reception, the body was placed; and then, when the offices had terminated, and friends had looked their last, the aperture was sealed up. In the case of a martyr a

palm branch, symbol of victory, was painted or carved outside. A little vase, probably a lachrymatory, for holding tears of grief, was often stuck on by means of plaster to the edge.

There is, however, another kind of tomb, called *arcosolium*, in the construction of which a deeper incision was made into the wall; and in this, instead of the mere niche or shelf, you have a capacious sarcophagus hollowed into the lower surface of the cutting, while over it is an arch fashioned in the stone. The remains of Christians held in high repute were usually deposited here; though sometimes an *arcosolium* was appropriated for the burial of a family, in which case two or three shelves were excavated in the tufa beyond the sarcophagus, under the arch.

Often a strip of marble or fragment of stone was substituted for the ordinary Roman tile in sealing the tombs; for the latter fabric, though cheap and easily procurable, was not so well adapted to take inscriptions; and it soon became the custom to write the name of the dead, his age, and other particulars, on the outer covering to his grave.

The following is one of the earliest inscriptions whose date is indicated; a translation alone is given for brevity's sake:

"IN THE TIME OF HADRIAN, EMPEROR, MARIUS, YOUTHFUL MILITARY COMMANDER, WHO LIVED ENOUGH, SINCE HE SPENT HIS LIFE AND BLOOD FOR CHRIST, IN PEACE."

Hadrian became emperor A.D. 117, about twenty years after the death of the Apostle John.

We meet with several epitaphs which record how long the separated (husband or wife) lived happily with the mourner in wedlock, without so much as one quarrel! In most instances the age of the dead is specified even to days:

"Thou hast fallen too soon, Constantia! admirable (pattern) of beauty and grace! who lived xviii. years, vi. months, xvi. days. In peace."

It is rather amusing to detect here and there, in the wording of inscriptions, traces of a defective aspirate in use among the early Christians of Rome; a prototype, in

fact, of the cockney difficulty with the letter H: on the one hand, to observe 'ic written for Hic, 'orá for Hora, 'onorius for Honorius; on the other *Hossa* for ossa, *Hoctobris*, *Heterna*, and so on.

The early tenants of the catacombs were principally converted pagans, the lesser number being Jews; the one but lately come from taking part in the solemnities and festivals of idol-worship, the other retaining remembrances of pride of race, exclusive in character, and familiar with the lore of sacred story: and traces of their previous tendencies are to be found portrayed on the walls: Christian paintings, tintured with pagan ideas on the one hand, and Jewish customs on the other. In a cubiculum near the Appian Way is imaged forth a funeral supper, after the manner of the Greeks; and not far off appears a graphic representation of an *agapé*, or love-feast.

Illustrations of Jewish history are very frequent. The centre place in the vault of one cubiculum is given up to a painting of the seven-branched candlestick, which, being among the spoil of Jerusalem brought in triumph to Rome, it is possible the painter may himself have seen; while the offering of Isaac, the three children in the furnace, Daniel in the den of lions, Jonah with the fish, Jonah reclining under his gourd, Moses striking the rock, and one or two others, are repeated in different places.

A very favourite symbol or figure with the early Christians was the fish; and this, it would seem, was of use in more ways than one; for the sign was a kind of freemasonry by means of which one Christian could distinguish another in a manner unintelligible to the enemies of the faith. It seems certain that little bone or wooden fishes were made and set aside for that purpose by the early Church. The signification of this emblem is not at first apparent, save, indeed, that Jonah's fish shadowed forth the resurrection; but it is found that the letters composing the Greek *ἰχθῦς*, a fish, are the initials to the words Jesus Christ, Son of God, Saviour. Thus the sign of the fish was sacred to Christ, and was even used at times in

place of the universal monogram* at the beginning and ending of inscriptions.

The monogram of Christ is made up of the first two letters in the name of Christ, X and P; and sometimes Alpha and Omega are conjoined with it. It was in familiar use among the early Christians of all lands, and appears in the catacombs (as some think) as soon as the days of Hadrian (A.D. 117), or perhaps before. Inscriptions were frequently begun or ended with this sign. The palm-branch, always a favourite symbol among the early disciples of Christ, was a sign allotted exclusively—so it appears—to those who had suffered as martyrs for the faith; a custom taking its rise probably from the vision of St. John in the Apocalypse: "I beheld, and lo! a great multitude stood before the throne and before the Lamb, clothed with white robes, and palms in their hands." "These," said the elder, "are they who came out of great tribulation."

The dove on the cross is a very expressive token, and bears with it a touching significance to weary, wayworn man, that where the cross (or suffering) is set up, and holds a place, there will the dove, indicative of the great Comforter, come with its healing wings. Or, on the contrary, it may be held to show forth that where the Holy Spirit deigns to fix His seat and make known His influence, there surely will be found the cross, tribulation, and suffering. Wandering, wayward man might wish it otherwise; but so it is, and ever must be, until this transitory season of trial gives way to the clear shining of God's face.

But most graceful, among the many pictures which decorate the walls, are the various representations of the Good Shepherd. The early Christians evidently loved the subject; they seem never to have tired of dwelling on or illustrating it in their own simple way; it held a central place in their hearts, as does the painting of it on the vaulted roofs of their cubacula.

One of such representations, from a vault in the Calixtine cemetery, pictures the shepherd bearing one of the flock on his

shoulders, which he has either brought back from wandering or taken up to rest in the fatigue of a long journey. On the compartment adjoining it the reaper is at work with the yellow corn, and by his side stands one gathering roses from the tree. Sometimes the shepherd and the sheep are seen peacefully reposing, suggesting the text, "He maketh me to lie down in green pastures, He leadeth me beside the still waters." Here is the shepherd again, but his loins are girt for travel, and his staff is in his hand. A few sheep linger near, watching while he plucks back a refractory member of the flock, or lays hold on one who has strayed. In one place the shepherd is represented as carrying his charge across a stream, bearing it carefully on his shoulders as he wades through, lest it should take harm.

There was a custom common enough with the ancients of placing in the tomb with the departed such objects as had been in familiar use with him during life. The early Christians in the catacombs adopted this usage to some extent, burying with their dead divers articles, which may now be seen in the Vatican and other collections. Among them are brooches, pins for the hair, coins, rings; articles of domestic use, such as lamps, candlesticks, and so on; most of these bear in their fabric some indication of their Christian origin.

In one place a little child in its last long sleep had been put to rest with its doll placed by its side; the little grave was sealed up, some ages of repose supervened, and all was forgotten; but in these latter times the workmen employed in the crypts broke into the tomb, and taking away the outer stone, revealed the plaything lying in company with the dust of the little maiden.

In some of the graves implements have been found which are conjectured, though without sufficient authority, to have been the instruments of torture buried with the martyrs who had suffered from them. Roman archæologists have classified them as follows: pincers to crush a limb, or simply to hold it, cutting into the flesh; scourges of knotted cords, or bronze chains

terminating in balls of iron, under the agonies inflicted by which a great number of martyrs died; claws or *ungulae* for tearing the sides or members of martyrs while stretched on the bed of torture; a kind of comb, a terrible instrument for producing pain, yet not deadly. That such tortures were inflicted upon the early Christians we know from the writings of contemporary martyrologists. But there is no evidence to show that the instruments by which they were inflicted ever passed from the hands of the executioners into those of the sufferers, or were buried in the graves of the martyrs. A more probable conjecture is that which identifies the relics with the tools used by the dead man during his life, and they are, with the exception of the knotted cords, just what would be required for carding and dressing wool.

The inscriptions on pagan sarcophagi and cinerary urns express only hopeless grief and dismay. The dead have been snatched away from light and life into darkness and annihilation. The survivors 'sorrow as those that have no hope.' A proud, hard stoicism under bereavement is the highest attainment of Roman virtue. Not unfrequently we find the language of bitter complaint against the unjust gods who have snatched away the innocent child from loving parents with no prospect of reunion. But with the introduction of Christianity we have the dawn of a new hope. The very name *cemetery*, a *sleeping-place*, suggests the thought of a happy awakening when the morning shall come. The word *depositus* implies the same idea: the body is laid in the grave as a temporary deposit, to be reclaimed at the appointed time. One inscription, already quoted, is typical of the sentiment of all: "Marius had lived long enough when, with his blood, he gave up his life for Christ." "Petronia, a deacon's wife," says, "Weep not, dear husband and daughters, believe that it is wrong to weep for one who lives in God; buried in peace." Placus, having inscribed upon the tomb of his wife the figure of a dove bearing an olive-branch, and the word

PEACE, goes on to say, "This grief will always weigh upon me; but may it be granted me in sleep to behold thy revered countenance. My wife, Albana, always chaste and modest, I grieve over the loss of thy support, for the Divine Author gave thee to me as a sacred gift. You, well-

deserving one, having left us, lie in peace in sleep; but thou wilt arise; it is a temporary rest which is granted thee." It is only since our Lord "abolished death and brought life and immortality to light," that such blessed and hopeful words as these have been possible.

THE GREAT WALL OF CHINA.



ure tell us that the greatest architectural curiosity which China affords is undoubtedly the frontier wall, built by the Chinese to prevent the frequent incursions of the Tartars. When this amazing barrier was first commenced is not known with accuracy, but the time of its completion was about

three centuries before the Christian era, so that, at all events, it has withstood the wind and weather of two thousand years. It is called by the inhabitants "the Great City Wall, a thousand *le* in length," and bounds the whole north of China, along the frontiers of three provinces, extending from the shore of the Gulf of Pe-chih-le to Se-ning, 15 degrees west of Pekin.

The wall is in general about 20 feet high, and broad enough for six horsemen to ride abreast on it; and throughout its whole length it is fortified at intervals with strong square towers, to the number of three thousand, which before the Tartars subdued the country used to be guarded by a million of soldiers. Its whole length, with all its windings, is computed at 1,500 miles, running over mountains 500 feet high, across valleys, rivers, and marshes, and along sandy hollows, which seemed incapable of admitting a foundation for such a weighty structure. The body of the wall,

according to Captain Parish, who accompanied Lord Macartney's embassy, is an elevation of earth, retained on each side by solid brickwork, and terraced by a brick platform furnished with parapets. The total height of the masonry is 25 feet; the basis of it is of granite, projecting about 2 feet beyond the brickwork, the height of which is irregular. The thickness of each retaining-wall is about 5 feet, and the entire thickness of the whole work is 25 feet. In many places there is a fosse, or ditch, beyond the foundation. The towers are furnished with embrasures and loopholes, but vary much in their dimensions. The bricks used in the construction are kiln-dried and well moulded, and are firmly cemented by a strong mortar of white calcined lime.

Rowing calculated that if all the bricks, stones, and masonry, of Great Britain were gathered together, they would not be able to furnish materials enough for the wall, and that all the buildings in London put together would not make the towers and turrets which adorn it.

Besides the great barrier, there is an additional inner wall near Pekin, which was built by the emperors of the Ming dynasty, for the purpose of enclosing a portion of the province between it and the old wall. These vast erections are now of little or no use, and are viewed by the people with indifference.

THE FIRST STEAMBOAT.



ANY persons of the present generation, accustomed as they are to the daily convenience of travelling by steamboat or rail, wonder how their forefathers managed "to get on" at all without the aid of this useful and willing servant.

Two hundred years ago we find writers giving vague hints that "fire" or steam engines might possibly be used in navigation. Then there were many attempts to do the work of sails and oars by the use of "mill-work," a rude kind of machinery, acting upon paddle-wheels, and moved by hand or horse-power. In 1682 an experiment was made in England of a horse-boat, with paddle-wheels fitted at the sides. This was so far a success, that the horse "walked away" with his boat, and "left the king's barge at Chatham, manned by sixteen powerful rowers, far astern."

Several other improvements followed. In 1705 Newcomen completed his atmospheric engine. Five-and-twenty years later Dr. John Allen proposed to propel a vessel by a jet of water forcibly expelled from the stern. He expressed his belief that by his method "large ships could be impelled at the rate of three knots an hour."

In 1736, Jonathan Hulls, an humble man of remarkable ingenuity, obtained a patent for his "invention of a machine for carrying ships and vessels out of or into any harbour or river against wind and tide, or in a calm." His idea of a steamboat (the first really practical one) may be seen from a picture, printed in his original pamphlet still in existence in the British Museum. It does not appear that he ever constructed a vessel on the plan proposed, having probably exhausted all his funds in his costly experiments, and being without influential friends to support him in his project.

Ingenious men in France and America made many attempts, with partial success, to carry out the English idea of steam navigation. But it was reserved for Scotland to produce the "first practical steamboat." Mr. Miller, a gentleman of Dalswinton, in Dumfriesshire, had made many experiments with boats propelled by the power of men and horses applied to paddle-wheels, and resolved to make the steam-engine do this work. Accordingly, a small engine was made by a Mr. Symington, at Edinburgh, at that time engaged in applying the steam-engine to wheeled carriages. His patient ingenuity was rewarded with success, and the steamboat travelled up and down Dalswinton Loch at the rate of five miles an hour. This was in 1788. Thus encouraged, he repeated the experiment with a larger vessel, which attained a speed of seven miles an hour. Such was the opposition that met the efforts of these public benefactors, that this boat was soon after dismantled and laid up in a creek at Carron.

In 1807 an American, Robert Fulton, who had seen Mr. Symington's boat, constructed the *Clermont* with a Boulton and Watt engine, to ply upon the River Hudson, between New York and Albany. Its early trips, says Fulton's biographer, caused quite a consternation. "It had the most terrific appearance from other vessels which were navigating the river when she was making her passage. The first steamboats used dry pinewood for fuel, which sends a column of ignited vapour many feet above the flue, and whenever the fire is stirred a galaxy of sparks fly off, and in the night-time have a very brilliant and beautiful appearance. This uncommon light first attracted the attention of the crews of other vessels. Notwithstanding the wind and tide were adverse to its approach, they saw with astonishment it was rapidly coming towards them; and when it came so

near as that the noise of the machinery and paddles was heard, the crews in some instances shrunk beneath their decks from the terrific sight, and left their vessels to go on shore; while others prostrated themselves, and besought Providence to protect them from the approaches of the horrible monster which was marching on the tide, and lighting its path with the fires which it vomited."

In more recent times, under Napier, Brunel, and other famous engineers, steam navigation has made great strides, and the

short-sightedness of those who predicted that "no steamboat would ever answer," has been fully exposed. From lochs and canals steamboats were soon afloat on rivers, and engaged on the ocean in the coasting trade. But even at this time men of science were firmly satisfied in their own minds that the navigation of the Atlantic by steam-power alone was impracticable. At last this idea was obliged to give way, and now the passage of the Atlantic is reckoned on with surprising certainty to a few hours.

FISH OR REPTILE?



NE of the most remarkable freaks of nature is seen in the case of a little creature, half fish, half reptile, which has during the last few years been brought to Europe in increasing numbers, and which is termed the axolotl, or ajolote.

At first sight this remarkable creature looks like a gigantic newt. At the same time, the possession of "gills," with other points of similarity to the finny tribe, suggest its being something of a fish. Its size, as commonly seen, is from that of a sprat to a herring; but specimens have been taken of much greater dimensions, some measuring sixteen inches in length. Its long, tapering tail included in the measurement. It has a large head, with a widely extended mouth, the tongue being flat, thin, and cartilaginous. In lieu of fins, it has four feet, somewhat like those of a lizard or frog, and by these it propels itself frog-fashion through the water. Its colour is a mixture of black and white, with some variety in the markings according to age and sex.

The axolotl is an inhabitant of the great salt lake Tezcoco, in the Valley of Mexico;

and, as far as is known, it is confined to this one, the water of most of the others being fresh, and seemingly not suitable to its existence. The water is extremely salt, and no fish can live in it, with the exception of here and there, at the mouths of certain fresh-water influent streams, some diminutive minnow-like species, by the Mexicans called "juiles." But these never venture out to the body of the lake, which is left to the axolotl, which alone finds its saline character congenial.

In this Dead Sea of the western hemisphere dwells this strange animal. But, although having all the lake's water to itself, it is not left either undisturbed or unmolested. Cranes, pelicans, and other predatory wading-birds, make war upon it; and it has furthermore to fear man. For, despite its repulsive appearance, it is esteemed as an article of food, and is in consequence an object of piscatorial capture. The "lake Indian," descendant of the Aztecs, is its greatest enemy. He not only pursues it with avidity, but eats it with the greatest gusto: to him it is a tid-bit, a *bonne bouche*; but, indeed, others besides the aborigines partake of its flesh, which they say is white, delicate, and savoury. Skinned and broiled, it is not only eatable, but fairly palatable; while it is also supposed to

possess valuable medicinal properties. Doctors recommend it for inflammation of the liver and hectic fever; and it is considered healthful food for children. A syrup compounded from gelatinous portions of the body, with certain herbs, is sold in the apothecaries' shops of Mexico as a mucilage beneficial in pulmonary complaints.

Of a somewhat similar character is the curious mud-fish of Africa.

Some years ago there arrived at the Crystal Palace, from Western Africa, four blocks of hard, dry, muddy clay, each about the size of a quartern loaf. These blocks of clay, each containing its own inmate, were sewed up separately in a canvas wrapper. According to the instructions received from the gentleman who sent them over, they were placed in a tank of fresh water. In a short time the inner case or cocoon, in which one of the animals was immediately enclosed, floated motionless to the surface. In the course of a short time, this cocoon became agitated—the creature within was evidently endeavouring to extricate itself. After a few struggles it burst away, and immediately commenced to swim about, and then dived into the mud at the bottom of the tank, sheltering itself from observation. On the following morning two more had made their appearance, and in the course of the next day the fourth fish floated to the surface, dead and putrescent.

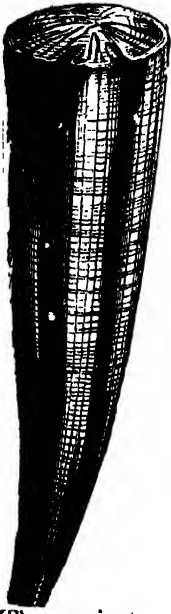
The three living individuals were meagre, and about nine inches long. They began eagerly to feed, being supplied with earth-worms, small frogs, fish, and occasionally with raw flesh. At times they were seen to attack each other, and one of them, probably in its endeavour to escape from its antagonist, leaped out of the tank and got into the large fountain-basin, where it was suffered to remain, among the water lilies and the gold-fish. The two others, remaining in the small tank, lived together on apparently good terms till the month of August, when it was discovered that one of them had killed its companion, and devoured nearly half of it. In three months

the cannibal had increased from nine inches to eighteen in length, so rapid was its growth. It was soon the sole survivor, and, though it was at liberty in the basin, was rarely seen; at last, however, it made its appearance near the surface, apparently sick, and finally was taken out dead. It was in splendid condition, measuring twenty-eight and a half inches in length, ten inches and a half in circumference, and weighed four pounds and three-quarters.

Mr. Bartlett says, "This creature masticates the food much, frequently putting it forward almost quite out of its mouth, and then gradually chewing it back again. It rises frequently to the surface of the water to breathe, and at other times supports itself on its fin-like appendages, and with the aid of its tail raises its body from the ground, the fins being bent or curved backwards. The movement of this animal is generally very slow, and would give one an idea that it was very sluggish: this, however, I have good reason to know is not the case, as, in attempting to capture the one at liberty in the large basin, it darted away with the rapidity of an arrow. I have reason also to believe that the animal finds its food as much by *scent* as by *sight*. With reference to the cocoon, the end covering the nose of the animal is rather pointed, and has an aperture about the size of a pin's head, which I have no doubt enables it to breathe during its state of torpor."

In its native country the mud-fish hibernates during the hot dry months in the mud of the swamps along the river where it abounds, making for itself a convenient cavity, in which it assumes a coiled-up form, and remains dormant till the return of the rainy season. Sometimes the case is almost or entirely composed of dry leaves, agglutinated together by the mucous exudation of the body. The mud-fish is found only in the rice fields, which are for more than half the year under water, and they are procured by the natives towards the end of the dry season, when they are dug out of the nearly dried mud. They are eaten fried and, like eels, have a rich oily flavour.

SECRETS OF THE EARTH.



THE term *fossil* signifies that which is dug out of the earth; it has, therefore, been applied to antiquities, as well as to natural, metallic, and mineral bodies. It is now more properly used to designate the plants and animals which occur in, and partake of, the character of the strata that compose the surface of the globe. Most of these fossil species, many of the genera, and some of the families, are now extinct.

In the darker ages fossils excited some attention.

The ancients, accustomed as they were to observe nature, could not fail to notice them, but they were sadly puzzled to account for the origin of these remains. Some supposed them to have grown in an extraordinary way, in the places where they were found; while others described them as resulting from a plastic power with which they considered nature to be endowed.

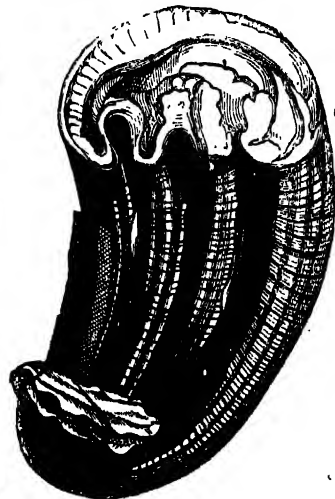
In inquiring how such substances are formed, we may consider some interesting facts in reference to what is called petrification. Most fresh water holds in solution a greater or lesser quantity of lime, and various causes occasion the calcareous earth to be precipitated. An instance of this kind occurs when a kettle or boiler long in use becomes furred, the fur being the calcareous matter which the water had contained. At the temperature of sixty degrees, lime is soluble in seven hundred times its weight of water; and if there be added to this solution a little carbonic acid, a carbonate of lime is formed.

Some springs contain so large a portion

of this earth when they first issue from the rocks, that incrustations of leaves, moss, baskets, nests containing eggs, and even old wigs and hair-brooms have been readily obtained. In Derbyshire there are springs of this kind, one of which is near the western bank of the Derwent, at Matlock. Italy, too, and many other countries have such springs. At the baths of San Filippo, in Tuscany, the stream is directed against moulds of medallions and other bas-reliefs, and very beautiful casts are thus obtained.

In Persia, one of these springs issues from the earth in bubbles, and falls into a basin of about fifteen feet in diameter. On flowing over the edges of this receptacle, the water spreads over the ground, forming numerous ponds and plasches, where it becomes hard, and produces a beautiful transparent stone, commonly called Tabreez marble. The petrifying process may here be traced from its beginning to its close. In one part the water is clear; in a second it appears thicker and stagnant; in a third quite black; and at last it is white, like hoar-frost.

The petrified ponds look like frozen water; a stone slightly thrown upon them breaks the crust, and the black water issues



forth; but when the operation is complete, a man may walk upon the surface without wetting his shoes. A section of the mass appears like sheets of rough



paper in accumulated layers. Such is the constant tendency of this water to form stone, that the bubbles become hard, as if they had been suddenly changed into marble.

When objects are exposed to the action of a petrifying spring, there is often only an incrustation. On breaking the specimen, the substance inclosed has undergone no change but that of decay, to a greater or less extent. In a true petrification, on the contrary, the substance is saturated throughout with mineral matter; every part of it has undergone a change; sometimes flint has filled up every interstice, and on slicing and polishing it, the most delicate texture of the original appears. Thus wood, commonly petrified by flint or chalcedony, may be cut so thin that, with a powerful glass, the structure of its tissues may be seen, and the particular kind of tree to which the specimen belonged determined, although for ages it may have been cased up in stone.

The *nummulites*, so called from their resemblance to a piece of money, are a singular genus of fossil shells. They vary in size from that of a crown-piece to one exceedingly minute; they are often piled on each other almost as closely as the grains in a head of corn; and they occupy an important place among fossil shells, because of their prodigious numbers in certain circumstances. Closely piled together, they

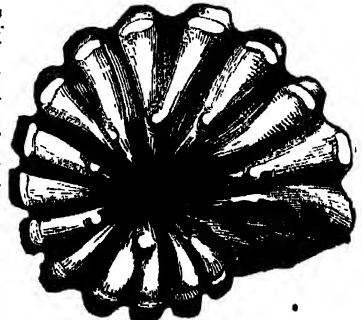
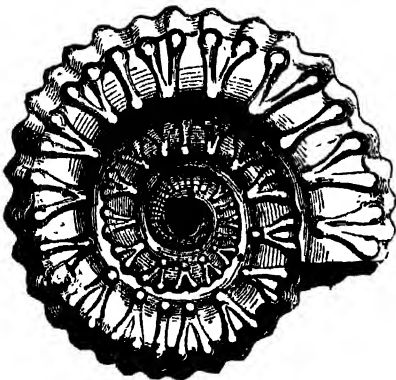
form a considerable portion of the entire bulk of many extensive mountains. They abound in the Alps and the Pyrenees; and some of the pyramids and the Sphinx of Egypt are composed of limestone loaded with these remains.

In the limestone rocks of Dovedale, in the county of Derby, and in the calcareous region which forms so large a portion of the district called "The Peak," marine shells are continually found incorporated. The grey marble of Derbyshire is an entire mass of marine productions.

The greater part of the island on which we live, and of the globe, with its millions of inhabitants, teems with fossils, the remains of those beings which existed many ages since in this earth, and which now prove their Creator to be wonderful in His works.

We may now glance at another large family—that of the *ammonites*—an extinct genus, the name of which is derived from their resemblance to the horns on the statue of Jupiter Ammon. This family is very extensive and remarkable. They greatly vary in size; some are only a line—the twelfth part of an inch; but others have been measured in the chalk near Margate, which exceeded four feet in diameter. All of them in their beauty, symmetry, and delicacy, demand attention, revealing as they do the wonder-working power of God their Creator.

Like a nautilus, an ammonite has an external shell, a series of internal air-chambers, and a syphon passing through them to the innermost extremity



of the shell. If the shell be examined, it will be found to be one continuous arch—the strength of which is proverbial; an arch coiled spirally round itself, so that the base of the outer whorls rests on the crown of the inner whorls, and thus the back is peculiarly calculated to resist pressure. More than two hundred species of ammonites are known in which strength is gained by this means. The larger ones were in former times ignorantly mistaken for petrified snakes; and impositions have been practised upon collectors by adding to specimens nicely carved snakes' heads, whilst the general absence of the head was popularly accounted for by a legend of a saint decapitating the snakes, and turning them into stone.

No fewer than 266 species of ammonites are peculiar to the lias deposits of Europe, whilst those of Britain alone contain 128.

Older than the ammonite, however, was the *nautilus*, which still survives in one representative, so well known from its beautiful pearly shell, which has furnished poets from the earliest times with food for imagination. Seventeen European species of *nautilus* are found in the lias strata alone.

Belemnites (from the Greek *belemnon*, a dart or arrow), are an interesting species of fossil mollusc, closely allied to the *Sepiada*, or cuttle family. No recent species of belemnites is known; fossil species are very numerous, and are found in all the oolitic and cretaceous strata. These remains are generally those of the shell alone, which is now known to be an internal shell, entirely included within the body of the animal, like that of the cuttle. The shell, as seen in the most perfect specimens, is double, consisting of a conical chambered portion, inserted into a longer, solid, somewhat conical or tapering and pointed sheath. The space between the phragmacone and sheath is occupied either with radiating fibres or conical layers. The chambers of the shell are connected by a tube, so that the animal probably had the power of as-

cending and descending rapidly, in the water. Its arms are known, from some singularly perfect specimens, to have been furnished with horny hooks; and these it probably fixed upon a fish, and descended with its prey to the bottom, like the hooked calamaries of the present seas. Remains of an ink-bag, like that of the cuttle, have been found in the last and largest chamber of the belemnites, but remains of this chamber, which must have contained all the viscera of the animal, are very rarely preserved, the shell having been very thin at this part. The part most commonly found, and generally known by the name of belemnite, is the solid mucro or point into which the sheath was prolonged behind the chambered shell. These have received such popular names as Arrowheads, Petrified Fingers, Spectre-candles, Picks, Thunderstones, etc., from their form, or from the notions entertained of their nature and origin. Belemnites appear to have been of very different sizes, in some of the largest the mere mucro is ten inches long, and the entire animal, with its arms outstretched, must have been several feet in length. Like the ammonite and the nautilus, they are principally found in the lias.

Here, then, is evidence that innumerable beings have lived, of which not one of the same kind any longer exists. It is equally true, that immense beds, composed of animal remains, extending for miles underground, are met with in many parts of the globe; that enormous chains of mountains are as vast monuments in which these remains of former ages are entombed; and that though lying thus heaped together, they are undergoing those changes by which at length they become the limestone which forms the humble cottage of the peasant, or the marble which adorns the mansion of the noble or the palace of the prince. And Science is able to spell out from them the outlines of the great plan of creation, and to turn with mingled feelings of awe and admiration towards its Great Designer!

A COUNTRY UNDER WATER.

HOLLAND has very often been the theatre of vast inundations; and, indeed, every year the population inhabiting the river districts have to expect a repetition of these calamities. Their forefathers, having experienced the fearful power of these resistless floods, have lined the rivers on both banks with dykes or dams, which are composed

of earth and mud, and built up to a height of twenty to thirty feet above the bottom or bed of the river. As long as frost does not change those fluent mirrors into marble, all goes well, for seldom the water which comes down from Germany reaches such a height as to overrun the dykes. But when the frosty breath of winter congeals the limpid crystal, the greatest danger threatens the villages and towns with which those districts teem. Nothing is to be feared, however, as long as the ice is unbroken.

But no sooner do the rivers begin to melt in Germany, than large pieces of ice, many of them being hundreds of yards in dimension, float down with irresistible speed. Nobody except eye-witnesses can have a conception of the crushing force of the floating ice. Bridges, houses, trees, are carried off, and poles five feet thick are cut off as with a razor. So long as the ice meets with no great object in its way, it floats down peacefully on the surface of the swollen water. But often, in consequence of the short windings of some rivers, a large piece of ice gets stopped, soon another piece of ice unites with it, and within a few minutes a large mountain of ice stops the river. Then the water, having no outlet, swells to an incalculable height. No dykes can be elevated enough to prevent its swelling. The hydraulic pressure becomes irresistible. Large pieces of floating ice

beat like storm rams against the earthen dykes; in a trice some large portion is cut out of them, and with thundering violence the raging element pours down into the fields which lie from thirty to forty feet beneath.

Such ice stoppings have often been the cause of most lamentable disasters in the country. The years 1784, 1799, 1809, 1820, 1827, and, above all, 1855, are written with blood and tears in the annals of Holland. In the latter year not less than thirteen dykes were broken by the ice; a fourth part of the large countries of Gelderland, Utrecht, North Brabant, and South Holland was turned into a sea. By one dyke-break near the village of Drenmel, nearly 50,000 acres of cultivated land were inundated, and a thousand families deprived of their homes and property.

But all this misery, however great, has been put into the shade by the calamities which came over the country in the early portion of the year 1861. Never before had the water reached such a height, nor was the fury of the ice so extravagant. The place which was first struck was the fertile and luxuriant district of Bommelerwaard, an island encircled by the rivers Waal and Maas. At nine miles distant from the town of Bommel are the flourishing villages Brakel and Poederoyen. There an ice-stopping took place about the 8th of January. The inhabitants of those places were at work day and night to fortify the dyke. Stones, earth, dung, and all sorts of rubbish, were brought to heighten the dyke, and men, women, and children exerted themselves in fighting the common enemy.

But all in vain. The ice broke through, and the thunder of the cannon, which is always fired to give warning, announced the sad intelligence to the surrounding villages and towns. In a few minutes the whole district was under water. The ice

swept away everything that opposed resistance. Numbers of rickyards, houses, and farms were uprooted and turned upside down. Soon the water covered the villages up to the roofs of the houses. Pieces of furniture, swimming cattle, roofs of houses, floated to and fro on the surface of the large pool, between pieces of ice which threatened to crush everything. Some few houses remained standing; their inhabitants saved themselves by escaping to the attics or to the roofs, where they spent all the night and a portion of the next day in fear and agony, till a boat came to take them off. Most people ran to the dyke, where it was not broken, and kept there waiting for boats, which, however, in consequence of the darkness of the night and of the floating pieces of ice, could not reach them until the next day, and then with great difficulty. There was no possibility of saving any property. Many persons had no time even for dressing, and fled in their under-clothes. Within two days, sixteen thriving villages were inundated, nearly 18,000 persons driven from their homes, and numerous lives lost.

All this happened while it was comparatively mild weather. Some days afterwards a severe frost again set in, and the whole inundated district was covered with ice. Many persons from all parts of the country now came to witness the fearful spectacle. It was a strange, heart-rending sight—a sea of ice, as far as the eye could see, and here and there a top of a tree or a roof of a house peeping out. A traveller in the district visited the spot on skates. Having reached the place where once the village of Gameren stood, he saw the church peeping out at half its height. He skated through the window, over the pulpit, and went out through the window on the opposite side of the building.

But this was only the beginning of the misery. A still greater calamity was in store. It was to be expected that a second inundation would take place, when thaw weather again would set in. With fear and trembling, every one watched the ther-

момeter. Soon the dreaded danger approached. About the end of January the rivers again melted, and now the poor village Leeuwen, situated on the bank of the Waal, not far from the town of Tiel, was the disastrous spot. On the first of February, the cannon announced a dyke-break in that place, and soon at other places, namely, Zuilickhem, Nieuwaal, etc., the furious element destroyed the work of man. At Nieuwaal, a piece of 110 yards' length was cut out of the dyke, leaving an abyss of thirty feet depth. Some twenty villages, with their surrounding farms, were covered with water and ice. Thousands of families were driven from their homes. To rescue themselves, 3056 persons clustered together on an elevated spot scarcely spacious enough for 1000. There they spent several days in the open air in that frosty season, with no other food than fifty loaves of rye bread for all of them. Some saved themselves on floating pieces of ice. One family, consisting of nine persons, floated away on a piece of thirty yards' dimension. In the night the piece was broken into two parts, and five of the family were severed from four. They thought each other lost for ever. But God held His hand stretched out over them. After two days' floating about they met again in a place of refuge, where they were hospitably taken in. Most affecting accounts have been related of the wonderful protection with which the merciful God preserved many of those victims. Thus, a girl of eight years was found on a floating roof, who had spent seven days and nights in that position. Still she was alive. She had subsisted on apples, which she had picked up while swimming along.

Thousands of pounds were sent in from all parts of Holland, from Germany, from Belgium, from France, and from England. Provisions and clothes were generously sent to Arnheim, St. Herlogentosh, Tiel, Bummel, Gorinchem, etc., where between 30,000 and 40,000 of the victims were hospitably received and cared for, the king himself visiting the scene.

...

A SUBMARINE VOLCANO.



THE people inhabiting the beautiful and flourishing islands of the Azores, which lie in the Atlantic, opposite the coast of Africa, were terribly alarmed in the summer of 1867 with the outbursting of a volcano in the sea. As a sort of preliminary to what might be expected to happen, the island of Terceira was shaken with some violent

earthquakes, the maximum of whose intensity was manifested near the sea-shore; the houses in a village were cracked, some overthrown, and the roads were blocked up with the wrecks of the inclosing walls.

At eight in the morning of the 1st of June, a most severe earthquake was felt, which knocked down most of the buildings that were still standing. Fissures were made in the sides of the ravines, and blocks of stone, detached from the mountain of Santa Barbara, rolled down the slopes. It was calculated that eighty houses fell on that day, but happily the inhabitants suffered little, owing to the precautions they had taken, a few only receiving slight wounds. Suddenly, during the next night, eight powerful detonations, like discharges of artillery, were heard; and when the dawn appeared, the surface of the sea presented, to a great distance, a yellowish green colour, and about three miles off the shore, an intermittent boiling, which gradually increased for the next few days. About nine in the evening they saw the water rise to a great height in a vertical column, three times in a quarter of an hour. This phenomenon was often repeated, increasing in size as each day passed, until, on the 5th of June, six or seven enormous columns were observed simultaneously, composed of warm water and steam rising violently from the level of

the sea, and only bending under the action of the wind at the height of many hundred yards, offering the appearance of a thick cloud of white smoke.

The emissions of steam and water were always accompanied with masses of black scoriæ, their deep colour contrasting strongly with the brilliant whiteness of the water-spouts. Some of these blocks seemed to be of the uncommon size of many cubic yards, but the greater part of the fragments were not larger than the hand. Those which happened to be in the middle of the water rose very high, under the pressure of the elastic fluid which surrounded them; but when near the edge, they fell out, describing a small curve to the surface of the sea, and forming a ring at the foot of the fountain. The place where these grand phenomena appeared was not always the same, as the white column rose sometimes here and sometimes there, but within a limited elliptical space of about six miles in length and one in breadth. Sometimes all the jets appeared at once, distributed on the same line, but at unequal distances. A sharp whistling sound, and terrible detonations like claps of thunder, redoubled by the echoes of the rocky coast, added to the awful character of the scene. To a distance of more than ten miles the sea was coloured with a great variety of tints; green, yellow, and red in every shade, due to the presence of iron in dissolution. The penetrating odour of sulphuric acid was very apparent, and the people affirmed that they saw sulphur floating on the water in the form of a yellowish white precipitate. It was remarkable that there was no trace of flame or incandescence even in the darkness of the night; the noise of the explosions could alone reveal the existence of the eruption.

Though such a large mass of scoriæ had been thrown out, it did not rise to the level of the sea, and thus form a new island,

owing, probably, to its great depth at this point, and also to the short duration of the phenomena. After the 2nd of June, the earthquakes ceased entirely; and from the evening of the 5th, no more large stones were sent up. On the 7th, about 10 P.M., the vapour had disappeared; thus the active period of the volcano only lasted seven days. The people were most unwilling to approach the scene of the tumult; but at length the captain of a boat consented to take M. Fonqué—who gives a description of the event—towards the spot. The sounding-line was frequently let down, but no modification of the sea-bottom could be discovered; nor was a trace left in the colour or temperature of the sea. After spending an hour, in the hope of discovering the object of search, they were returning in despair, when a boatman pointed out a slight boiling in the waves. A few yards square of the sea were evidently agitated by some gaseous bubbles, which broke on the surface of the water. By means of a suitable apparatus, the gas was collected, and found to consist chiefly of hydrogen.

It is very possible that these phenomena may throw some light upon the origin of mountains—a subject which has much puzzled natural philosophers. From what we know of the depth of the soundings round St. Helena and other islands, we may consider them as mountains rising from the bed of the present ocean. The circumstance that marine remains are found at great elevations in mountains, demonstrates that the sea must for many ages have flowed at those elevations. But the apexes seem by their structure to have formed part of the original crust of the earth, unless, indeed, we are to suppose that in all instances they are volcanic, and have been raised to their present height by discharge of lava, and the scoræ of internal local fires. This last seems a probable supposition, and in this case mountains must be regarded as the work of time. When raised, the returning action of the sea at their base may have undermined them, and we may probably

ascribe to their overthrow many surprising irregularities which appear on the surface of the earth.

If the visitor to the Azores (says *Chambers' Journal*) ascends the summit of Mount Brazil, the large volcanic cone, he will there see the effects of the amazing force of eruption in former days. It is evidently the præduction of a submarine volcano, as the burning matters have been projected mixed with the existing soil, with sand, and with sea-shells. All these materials have been welded together in falling back, forming layer after layer round the point of emission; and now that time has dried and solidified them, they are transformed into a tufa (tuff) sufficiently compact to form excellent stone for building purposes. The mountain rises steeply on all sides from the sea; against it the waves beat furiously during the frightful storms of winter, and detach large fragments every year, forming an immense rampart of jagged rocks, the resort of a variety of birds.

It is not very difficult to ascend to the edge of the crater, where the eye plunges to the bottom of a cavity about a mile in diameter; the highest points being about one hundred and seventy yards above it. There are two depressions of unequal depth, as if the volcano had burst out at different mouths. Now fields of maize cover the lower part of the concavity, thousands of beautifully bright amaryllids adorn the interior slopes, and in the autumn form splendid decorations with the rosy corollas. The roads are formed of a vitreous sand with yellowish green reflections, and black crystals which sparkle in the sun. This rich garden, such a contrast to the same scene thousands of years ago, is sometimes visited by a fearful enemy, when bands of locusts settle down upon it. Arriving from the African shore when the wind blows from the south-east, they land on this advanced promontory, carrying devastation with them, without even touching the adjacent country.

THE SALT MINES OF HALL.



THE Hall, in the Tyrol, are enormous salt mines, a graphic description of which is given in Inglis's Tour in that district:—

"In the interior, as well as outside, Hall bears upon its front the appearance of great antiquity. Gloomy old houses flank narrow winding streets; scarcely one modern building is to be seen; the ancient wall-towers and little gates yet remain, as well as the deep ditch, and recall to mind the wars of early times, of which Hall was so often the scene. It is scarcely possible to conceive a more horrible abode than Hall; it is constantly enveloped in a dense atmosphere of smoke, which not only darkens the air and blackens the houses, but throws a dinginess over the dresses of the people and makes them appear of a sootier and duskier race.

After breakfast I proceeded to visit the mines, clothed in a suitable dress; and with a staff in my hand, and preceded by flambeaux, I followed my conductor into the mine. The visit commences with a descent of 300 steps, when one may fairly believe himself in the bowels of the mountain.

'Tis a strange empire one finds in these dismal abodes; life is a different thing when sunlight is withdrawn, and there is an icy feeling falls upon the heart, as well as on the senses, when we look around these dismal galleries and dark walls, dimly lighted by a few ineffectual flambeaux that convey truly the idea of 'darkness visible,' and scan the dark subterranean lakes, whose extent and profundity the eye cannot guess but by a plunge of a fragment of the roof and the dim glimmer of the lights, and hear the distant stroke of the miner's axe far in the interior of the caverns. And still more do we feel the difference between the

world above and regions such as these when we reach the solitary miner in some vast cavern with his single candle, striking his axe ever and ever into the dull wall. But along with these feelings, astonishment and admiration are engendered at the power of man, whose perseverance has hollowed out the mountain, and with seemingly feeble instruments—his hammer, arys, and little axe—has waged war with the colossal works of nature. The results are, indeed, almost incredible. No fewer than forty-eight caverns have been formed, each from one to two acres in size. One of the galleries is three leagues in length. I was assured that, to travel all the galleries, six whole days would be required. The manner of proceeding is thus: when these subterranean caverns are formed, the miners detach fragments of the native salt from the roofs and walls; and when the cavern is sufficiently filled with these, pure water is let in, which dissolves the salt, and the water thus impregnated is conveyed by the conduits from the mines to the manufactories of Hall.

When I visited the mines, some of these caverns were dry, and the miners were employed in them; others were salt lakes, in which the more silent operation was going on. Occasionally a distant hollow sound is heard approaching nearer and nearer, which one easily mistakes for the rushing of water; this is occasioned by the little chariots which carry away rubbish to the mouth of the mine; the path is a railroad, and the little chariots fly along it with a frightful rapidity. When the sound is heard approaching, it is necessary to retire into one of the niches that are formed in the wall, and the young miners, seated in front of their chariots, seem as they pass by, like gnomes directing their infernal cars.

The number of miners employed is 300, and the pittance of wages which they receive is miserable. They are paid according

to seniority.. Their labour is, however, not without intermission; they work and rest four hours alternately. Interesting and curious as a spectacle of this kind is, it is impossible to be restored to the 'sun and

air,' without a feeling of satisfaction; and we are almost surprised to find how genial the sunshine is, and how beautiful the sky; and we drop with cheerfulness a mite into the poor miners' box."

RINGING THE WILD HORSE.



It is well known that on the vast South American plains troops of wild horses roam at liberty. To catch these noble creatures expeditions are occasionally organized. Says a hunter:—

"As we cast our eyes over the valley, we beheld a troop of wild horses quietly grazing on a green lawn about a mile distant to our right; while to our left, at nearly the same distance, were several buffaloes, some feeding, others reposing and ruminating among the high rich herbage, under the shade of a clump of cotton-wood trees.

A council of war was now held, and it was determined to profit by the present favourable opportunity, and try our hand at the grand hunting manœuvre which is called 'ringing the wild horse.' This requires a large party of horsemen, well mounted. They extend themselves in each direction singly, at certain distances apart, and gradually form a ring of two or three miles in circumference, so as to surround the game. This has to be done with extreme care, for the wild horse is the most readily alarmed inhabitant of the prairie, and scents a hunter at a great distance, if to windward.

The ring being formed, two or three hunters ride towards the horses, who start off in an opposite direction. Wherever they approach the bounds of the ring, however, a huntsman presents himself and turns them from their

course. In this way they are checked and driven back at every point, and kept galloping round and round this magic circle until, being completely tired down, it is easy for the hunters to ride up beside them and throw their lariats over their heads. The prime horses of most speed, courage, and bottom, however, are apt to break through and escape; so that, in general, it is the second-rate horses that are taken.

Preparations were now made for a hunt of this kind. The pack horses were taken into the woods, and firmly tied to trees, lest, in a rush of the wild horses, they should break away with them. Twenty-five men were sent, under the command of a lieutenant, to steal along the edge of the woods, and not to advance or show themselves until the horses dashed in that direction. Twenty-five men were sent across the valley to steal in like manner along the river bank that bordered on the opposite side, and to station themselves among the trees. A third party, of about the same number, was to form a line stretching across the lower part of the valley, so as to connect the two wings. Beattie, and our other half-bred, Antoine, together with the ever officious Tonish, were to make a circuit through the woods so as to get to the upper part of the valley in the rear of the horses, and to drive them forward into a kind of sack that we had formed; while the two wings should join behind them and make a complete circle.

The flanking parties were quickly extending themselves, like the links of a chain, across it, when the wild horses gave signs that they scented an enemy; sniffing

the air, snorting, and looking about. At length they pranced off slowly towards the river, and disappeared behind a green bank. Here, had the regulations of the chase been observed, they would have been quietly checked and turned by the advance of a hunter from among the trees; unluckily, however, we had a wild-fire jack-o'-lantern little Frenchman to deal with. Instead of keeping quietly up the right side of the valley to get above the horses, the moment he saw them move towards the river, he broke out of the covert of woods, and dashed furiously across the plain in pursuit, being mounted on one of the led horses belonging to the Count. This put an end to all system. The half-breeds and half-a-score of rangers joined in the chase. Away they all went over the green bank; in a moment or two the wild horses reappeared, and came thundering down the valley, with Frenchman, half-breeds, and rangers galloping like mad and yelling like devils, behind them. It was in vain that the drawn line across the valley attempted to check and turn back the fugitives. They were too hotly pressed by their pursuers. In their panic they dashed through the line and clattered down the plain. The whole troop joined in the headlong chase; some of the rangers without hats or caps, their hair flying about their eyes, others with handkerchiefs tied round their heads. The buffaloes, that had been calmly ruminating among the herbage, heaved up their huge forms, gazed for a moment with astonishment at the tempest that came scouring down the meadow, then turned and took a heavy rolling flight. They were soon overtaken; the promiscuous throng were pressed together by the contracting sides of the valley, and away they went pell-mell, hurry-skurry, wild buffalo, wild horse, wild huntsman, with clang and clatter, and whoop and halloo that made the forests ring.

At length the buffaloes turned into a green brake on the river bank; while the horses

dashed up a narrow defile of the hills with their pursuers close at their heels. Beattie passed several of these, having fixed his eye upon a fine Pawnee horse that had his ears split and saddle on his back. He pressed him gallantly, but lost him in the crowd. Among the wild horses was a fine black mare. In scrambling up the defile she tripped and fell. A young ranger sprang from his horse and seized her by the mane and muzzle. Another ranger dismounted and came to his assistance. The mare struggled fiercely, kicking, and lating, and striking with her forefeet; but a noose was slipped over her head, and her struggles were in vain. It was some time, however, before she gave over rearing and plunging and lashing out with her feet on every side. The two young rangers then led her along the valley by two lariats, which enabled them to keep at a sufficient distance on each side to be out of the reach of her hoofs; and whenever she struck out in one direction, she was jerked to the other. In this way her spirit was gradually subdued. As to that little scaramouch Tonish, who had marred the whole scheme by his precipitancy, he had been more successful than he deserved, having managed to catch a beautiful cream-coloured colt, about seven months old, that had not strength to keep up with his companions. The mercurial little Frenchman was beside himself with exultation. It was amusing to see him with his prize. The colt would rear, and kick and struggle to get free, while Tonish would take him by the neck, wrestle with him, jump on his back, and cut as many antics as a monkey with a kitten.

Nothing surprised me more, however, than to witness how soon these poor animals, thus taken from the unbounded freedom of the prairie, yielded to the dominion of man. In the course of two or three days the mare and the two colts went with the led horses, and became quite docile."



A TROPICAL SNOW MOUNTAIN.

AFRICA is the grave of many noble spirits. The Rev. Alfred. New, after a brilliant and self-denying career as a missionary and explorer, at last succumbed to the malarious climate. His account of the ascent of Kilima Njaro, the tropical snow mountain, will exhibit the adventurous nature of the man :—

“At length all difficulties were removed, and our party was organized. This time I took only the guide and Tofiki of my own men ; the Waniki were utterly useless, and were left behind, of which they were heartily glad. As guides, Mandara gave me Mtema and a brother of Marondo, Marondo himself having fallen ill. The first made his appearance at seven in the morning, and we set out at once. We called for the other guide on the way, and found him busily engaged preparing for the trip. Standing before his hut, he was receiving at the hands of his wife a thick covering of grease. He was a fine, tall, muscular fellow, quite a model, and absolutely without clothing. The scene brought to my mind the meeting of Ulysses with the Princess Nausicaa on the shores of Phœacia, only there was less of shame and delicacy, if not more innocence, in this than in the Homeric scene. Our arrival did not disconcert them in the least ; the lubricating process went on till every part had received its due proportion of grease, and the hero shone again. But his wife was murmuring rebellion in his ears all the time. “What,” said she, “are you to have for this journey ? It is one of danger. You will feel the cold ; let them give you a cloth before you start. Unless they do so, I would not go if I were you.” This was mentioned to me. I would gladly have given a cloth had I had one, but I had not, and explained the

arrangement I had made with the mangle instead. Nothing more was said, and the man, seizing a bundle of skins, at once led the way.

Making a halt at the border to procure men and food, as we had done before, we continued our way. Our party completed, we numbered a dozen men : myself, Sadi, Tofiki, and nine Wachaga. Crossing the border at eleven a.m., we pursued the path we had taken before till two p.m., when we turned a little more to the left, going almost due north. Our present guide seemed more familiar with the work than Marondo :—

‘He knew each lane, and every alley green,
Dingle or bushy dell of this wild wood,
And every bosky bower from side to side.’

The weather was very fine and clear, though in so dense a forest we scarcely got a glimpse of the sun. On, on ! up, up ! we urged our way till the sun was fast declining to his rest. The rate at which we walked tried our utmost strength. Reaching the stream we had crossed on the former occasion, we paused. The guide sank from sheer exhaustion, Tofiki looked fatigued, and I confess I was weary. The stream here was much smaller than at the part where we had met with it before, for this time we had come upon it at a point much higher up the mountain. The water was so cold that I could only drink it in sips, it made my teeth ache. Ascending the steep face of the mountain on the other side of this stream, we encamped in a wood composed of broom from twenty to thirty feet in height.

In a few moments the Wachaga put up a long shed, and did everything we asked them to do without a murmur. Without a scrap of clothing they ran about in the cold, and never gave in till the work was done. The air was very sharp and frosty ; I, who had clothing, felt this, and it is a wonder to

me how the others bore it so well. I made up for myself an excellent bed of the fine tops of the trees and moss combined, the latter being so abundant on the ground as to yield beneath the feet like a feather bed. Fires were made large enough to roast an ox, still we could keep ourselves warm only on one side. Dividing my blankets between myself and the rest of the men, we rolled ourselves up for the night.

The next morning at 5.30 the thermometer, placed on a log of wood under the shed, read $37^{\circ} 30'$. The hoar frost was as thick on the leaves as I have ever seen it at home. In a few minutes we issued from the forest, when our guides paused, and pointed to something directly before them, and there rose Kibo, apparently within an hour's march from us. It was a glorious sight. Not a cloud streaked the ethereal blue above, and in the light of the morning's sun the snow shone with dazzling splendour. I thought of the words of the Psalm which struck Mr. Rebmann when he obtained in the far distance his first view of Kilima Njaro, twenty-three years before: 'Praise the Lord, I will praise the Lord with my whole heart. The works of the Lord are great, sought out by all them that have pleasure therein. His works are honourable and glorious, and His righteousness endureth for ever: He hath made His wonderful works to be remembered.* The Lord is gracious and full of compassion. He hath shown His people the power of His works, that He may give them the heritage of the heathen.'

Above the grass we reached an Alpine region of grass-covered hills, with a few patches of moss-draped wood here and there. The grasses were very different from the short lawn-like turf of the lower regions, being of a bladed and a much taller kind, but still abounding in clover and variegated with flowers. From one root sprang, high above all else, a stem bearing a large pink flower, tall and graceful as the lily. Another plant, much resembling sage in appearance, attracted my attention, and plucking the leaves, I found them highly

fragrant. From one of the loftiest elevations in this region I turned to take a retrospect of the country over which we had passed. No wonder that the atmosphere was so clear, for we were far above the region of the clouds. Down rolled the mountains from our feet till all was hidden, and the eye rested upon illimitable fields of snowy clouds, exhibiting all manner of fantastic shapes, marching in grand array, performing wondrous evolutions, unfolding, expanding, changing their forms and position in endless variety, and displaying the most fascinating charms.

Turning our backs upon this we resumed our climbing, which, relieved though it was by a slight descent now and again, was toilsome work, and made large demands upon our lungs. Sadi fell far behind, being almost beaten, and unable to carry even his own gun. *Height after height was ascended with occasional pauses, till we reached another vegetable region,—one with heath, varied with detached clumps of a wiry kind of grass, many plants with frosty looking leaves, and exceedingly pretty flowers; higher the steeps were covered with out-cropping rocks, not of granite and felspar, of which all the surrounding mountains are composed, but of pudding-stone or conglomerate, and grey, compact, laminated rocks.

At noon we halted upon a rocky ridge, directly before the snowy Kibo, in full view of Kimawenzi, and apparently very near the 'eternal snows.' The sun poured his vertical beams upon us, yet the air was so cold and the wind so bleak that the men shivered. Setting up the thermometer upon the point of a spear, the mercury descended in half an hour from 70° (I had carried the thermometer in my pocket) to 57° , and in another half an hour to 50° , and this in the full blaze of the noon-day sun.

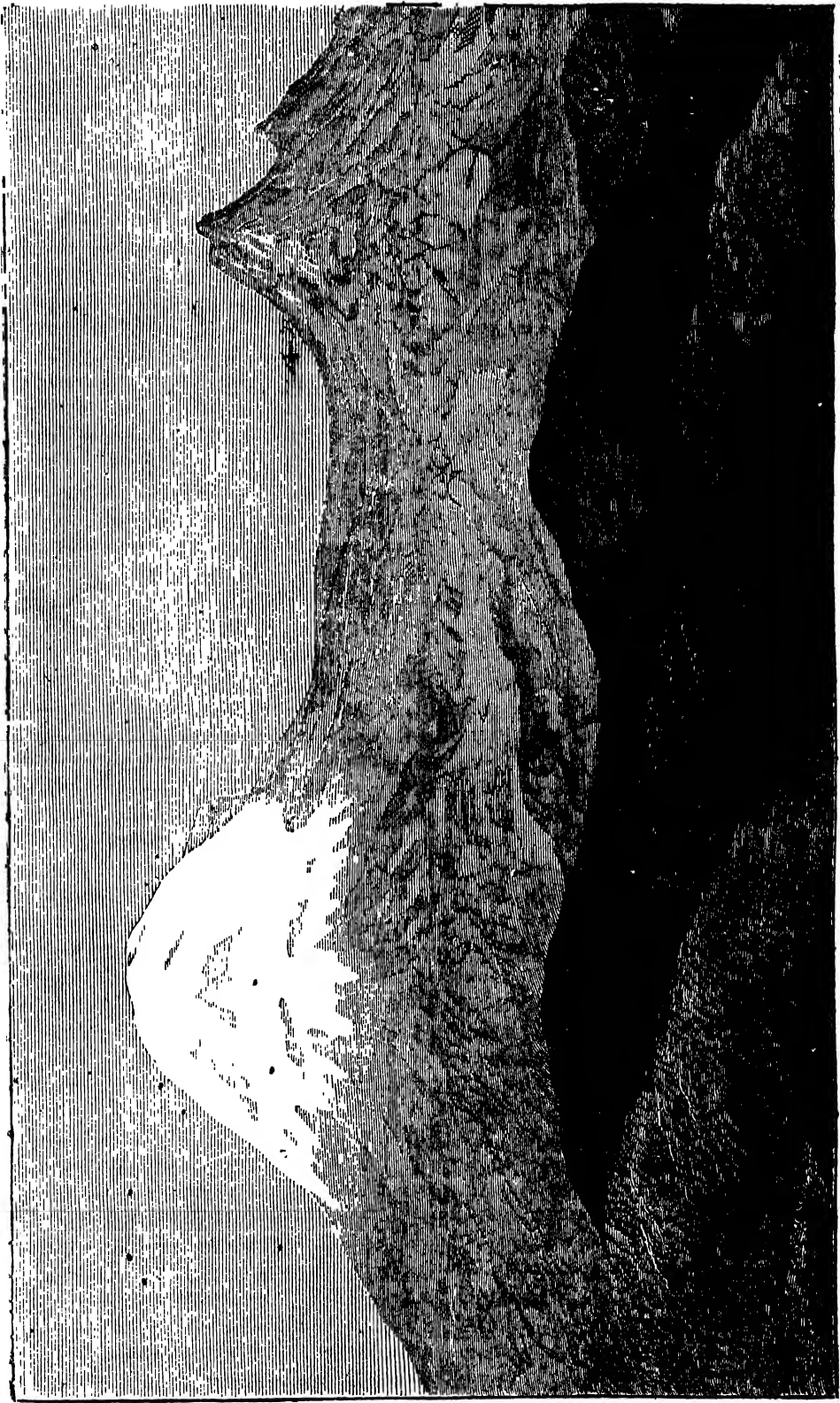
I was struck with the exceeding dryness of the soil. After encountering, as we had done so recently, the heavy rains of the forest, and walking up to our ankles in the mud of that region, the dryness here was remarkable. No rain could have fallen

here lately, for the simple reason that the cloud level at this season of the year is far below this. However, soon after noon heavy mists came sweeping up the mountain, which ere long obscured everything. At 4 p.m. we came to a large overhanging rock, forming a kind of cave, and here our Wachaga advised we should put up for the night. The rubbish cleared away, a thick bed of heath strewn upon the ground, immense fires made of the roots of the bushes, and we were prepared for another night. The fires blazed furiously, yet they burnt without warming us; beard and whiskers were singed off, yet we were cold. Sadi greatly amused us, he was so nervous. The rocks echoing our every word, he thought there were other beings on the mountain besides ourselves. All the stories of elves, goblins, ghosts, ghouls, and other spirits of all sorts he had ever heard of regarding the occupants of Kilima Njaro, now came home to him and greatly distressed him. When he lay down he thought he heard the shock of an earthquake. 'There!' he exclaimed, starting up; 'what was that? The very earth moves! There! there!'

Travelling, like poverty, makes a man acquainted with strange bed-fellows. That night I lay in the midst of a dozen savages of whom I knew nothing, and who for many reasons were not a desirable party to sleep with. One of my neighbours woke me up in the middle of the night by tugging at my blanket, and when I tugged it back, he made such pitiful complaints about 'mbetro' (cold), and 'kukomeka' (dying), that I could not deny him the use of it. In the middle of the night the mercury sank to 23°, but at dawn it rose to 34°. The morning was extraordinarily clear. The snows, too, how near they seemed to be! There seemed to be but one ridge between us and them, and to all appearance we should reach them in ten minutes. The sunrise that morning was a 'flood of glory'; and what a scene lay outspread before us! There was nothing to bound our view but our own weak powers of vision. East, west, south, all lay before us; in the clouds thousands of feet below

us, extending in an illimitable sea of snowy, convolving masses, or, to speak figuratively, like a multitudinous army waiting in the still morning air till they should receive their marching orders, be marshalled by the winds, or dispersed to their quarters by the monarch of the day. Through the openings in the clouds peeps of the distant mountains and of the plains below were obtained. A little south of east was Bura; farther south, in the misty distance, were the hills of Usambara; nearer were Parof Ugono; and at the foot of the latter lay the lake Jipe, its whole outline being clearly defined. A little to the north of Jipe a column of smoke indicated the position of Taveta; and north of that, within perpendicular cliffs, was a little blue sheet of water which I knew must be the lake of which I had heard such strange tales. Farther to the south were Kahe, Arusha wa Tini, the mount Sogonoi; and behind Sogonoi other mountains and hills. To the west was the plain of Arusha wa Ju, and the mountain Meru pointing to the skies. All other mountains now appeared very insignificant; but Meru was still a grand object. Turning to the north, on the right was the frowning Kinawenzi, and on the left Kibo, which, illumined by the rising sun, shone transplendently: the first looking not unlike L'Aiguille du Dru, and the second Jungfrau of the Alps.

Commencing our toils early, at 8 a.m., we reached a heap of rocks, among which grew a solitary tree, where we sat down to rest. The Wachaga said this was as far as they dared to go. 'We have come,' they continued, 'farther than any one ever came before, and this is all we can do. There is Kibo very near now; if you wish to go on, you can do so, and we will wait here till you come back.' I expected this. Tofiki, however, though he was feeling the cold severely, declared his determination to go with me to the last. Every encumbrance was now laid aside, for we had our work to do. For a climbing stick I borrowed a spear, while Tofiki relieved a bow of its string, and took that. Now, leaving the rest of the



From a sketch by the Rev. A. Nene.

THE SUMMIT OF KILIMA NJARO.

party over the fires which they had kindled in the centre of the group of rocks, where they were well sheltered from the cutting winds, Tofiki and I went on alone.

The higher we ascended the more rocky the steeps became; but for a while a little heath, and various kinds of frosty-looking plants with pinkish and yellow flowers remained. The grey rocks, brownish-green heath, and ash-coloured plants gave to the region a peculiarly mottled appearance, striking for its uniformity and extent. At length the vegetation dwindled down till it disappeared altogether, and there was nothing left but rocks and rocks.

Over the rocks we ascended, ridge after ridge, to find that there was yet another. It *was* wearisome work. At length the rocks gave place to clear tracts of loose, dry sand, in which we sank up to our ankles; and now we began to find it difficult to respire. It was as if there was no breath in the atmosphere. A distance of twenty or thirty yards exhausted us. My lips were cracking, the veins in my head felt like bursting, my head swam, and, I was going to say, my very wits seemed wandering.

Great changes were coming over Tofiki. He could not keep up with me, though I urged him constantly to do so. 'Pole, pole (slowly, slowly), Buana,' he gasped out, and I slackened my pace. Still he remained behind. He was fast failing. When we paused for breath, I rested; he rather fell than sat down. His efforts to speak were mere sputterings. At length he mustered courage to say, 'The ascent of this mountain is nothing to me; but I do not want *you* to be beaten. I fear, however, I cannot go much farther.' Now, nothing but the sternest necessity could have elicited this confession from him. I did not wish to try him too severely; still, as we were so near the goal, I cheered him on. I got from one stage to another, till, falling to the ground and gasping for breath, he stammered out, 'Buana, I cannot go on; but if you have strength, try alone, never mind me; I should not like

you to be beaten; I will wait here for you. If you come back, well and good; if not, I shall not move from this spot, but shall die here!' and the good, faithful fellow meant every word he said. I would not have sacrificed him for all the 'eternal snows' on the world; but I could not give up yet. If I could only reach the snow so as to touch it, I should be content; and it now seemed really within my reach. I paused to take a view of my situation. There was Kimawenzi on my right some miles off, but in appearance very near, almost standing over me in awful majesty. Between myself and it there was nothing but a wind-swept declivity of coarse, dry sand, as clean and as smooth as a sea-beach; but I was not bound thither. A little on my left was the snowy Kibo. I was almost flush with its southern face, and, I believe, quite as high as its snow-line on that side, and higher than the snow lies on its western slopes. The snows which were visible now were those lying on its eastern side, and they were at a much greater altitude than those on the other sides. The snow on the east of Kibo is a thick cap upon the very top, but trending downwards in an irregular line towards the south. At the south-east of the dome there is a precipice, at the bottom of which is a long tongue of snow, from which the snow-line runs downwards round the dome to the west. It was this patch of snow upon which I had all along fixed my eye, and which I desired to reach. Directly before me was the ridge which runs between the two summits; but it is not the one that is seen from below. It rises into two mounds in the centre, but is otherwise smooth and regular. The distance between Kibo and Kimawenzi did not appear so great here as it did from our camp at Moché, but this may be due to the refraction of the atmosphere.

But how was I to reach that patch of snow? There was the saddle ridge before me, and the way to it was clear, there being nothing between me and it but a smooth, sandy hollow. Gaining its top, I could pursue my way down hill to the top of the

precipice, at the bottom of which the patch of snow I was aiming at lay; but would the descent of the precipice be practicable? If not, could I reach the topmost rim? I feared not; for the ascent is so steep and rocky that to climb it would require ladders and ropes, with which I was not provided. There remained then the direct route to the spot. The ground was almost level, but immense detached rocks encumbered the way and prevented my seeing what was beyond them. However, I determined to take this direction, so bade Tofiki 'kua heri' (good-bye), telling him I should be back with him before long, I went on; but it was hard work, breathing being so difficult that I had to pause at every few steps for breath. The sensations, too, which came over me at the idea of the profound solitude, of standing on heights to which no human being had ever before ascended, were overpowering. The situation was appalling, there was a grandeur and magnificence about the surroundings which were almost too much for me; instead of exhilarating they were oppressive.

I had not gone far, however, before I came to a tremendous gulf, dropping almost sheer down between myself and the patch of snow to which I hoped I was making my way. This gulf was all that now remained between myself and it, but what an ALL! The snow was on a level with my eye, but my arm was too short to reach it. My heart sank; but before I had time fairly to scan the position, my eyes rested upon snow at my very feet! There it lay upon the rocks below me in shining masses, looking like newly-washed and sleeping sheep! Hurrah! I cannot describe the sensations that thrilled my heart at that moment. Hurrah! I thought of Tofiki. Returning a short distance, I called to him at the top of my voice, and in a little while he made his appearance, looking horrified. What had I seen? Strengthless as he was, my cries went through him like an arrow, and gave him new vigour. He expected to find me in the hands of some monster, about to be tossed into some

abysmal depth! Reaching the spot where I had seen the snow, he exclaimed, 'There is snow! What more do you want, Buana?' 'Nothing,' I observed, 'but we must carry some of it away.' It was frozen as hard as the rock itself, but with the spiked end of the spear I carried I broke off several large masses. Tofiki put them into his blanket, slung them over his shoulders, and away we went downhill in triumph! I made the more haste as my head was so giddy I was afraid of swooning. Tofiki, too, looked wild and strange; and besides this, as noon was approaching, the mist would soon come sweeping up the mountain and make it difficult for us to find our party. As it was, we followed down our footprints in the sand, and, coming to the rocky region, steered our course by the smoke which rose from the fires of our people. Reaching our party, they looked at us inquiringly, as much as to say, 'Well, what success?' Tofiki threw down the burden of snow, saying, 'There's the white stuff; look at it. Kibo is beaten at last!' When I took the snow and began crunching it, as if it were the greatest delicacy, the men looked at each other as much as to say, 'What uganga is the Mzungu up to now?' while some said, 'Who ever saw a man eating stones before?' Alkma stared and gaped, looked first at the snow and then at me; but remained dumb with astonishment. 'Luma (eat) yourself,' I said. He looked afraid, but after a while, putting it to his mouth, he instantly shouted, 'Mringa! mringa! (water! water!) Let us take it to the mange!' 'Yes,' said my guide; 'and I shall take some to the coast, where I shall sell it for medicine! Everybody will want a piece of the white stuff that came from Kilima Njaro!' I told them it would melt before we could reach Moche; but they smiled incredulously, saying, 'Who ever heard of stones melting?' It was broken up and put into one of the calabashes. Tofiki and I were feeling all right again now; no sooner had we entered the lower stratum of the atmosphere than

our strength returned to us, and we felt quite new men.

Now for our rush down the mountain. Down, down, over steep we should never have thought of ascending, we hurried at headlong, and almost dangerous speed, till we reached the forest, where, 'in thick shelter of black shades embowered,' again we spent another night. We did not get much sleep, for the Wachaga spent the time in singing, and they made the forest ring with their wild music.

Next day, reaching the border, the natives performed a ceremony to disenchant us, and our whole party was christened with a professionally prepared liquor, supposed to possess the potency of neutralizing

evil influences, and removing the spell of wicked spirits.

At camp we were very heartily received, the people crowding about us in large numbers to hear the news. None were more curious than the mange. He was very disappointed to hear that the 'white matter' was not silver. 'But,' said Mtema emphatically, 'it is water, mange! nothing but water, mange! There it is in the calabash; look at it, mange.'

The stones and plants which we had brought down with us were closely examined; they were quite unknown to the people, and greatly astonished them. They left the camp, saying, 'The white man is Eura!' (a god.)"

THE PIRATES' TREASURE.



For a fort in Florida, during the Seminole war, a man named Richard Blount lay wounded and dying.

A keen observer might have discerned in the emaciated features, well covered by an iron-grey, untrimmed beard, traces of refinement—almost effaced, it is true, by the unmistakable mark of a turbulent and perhaps criminal career.

The surgeon in charge of the stockade seemed a man of warm heart and tender sympathies, which had not been blunted by familiarity with suffering. He carefully tended the dying soldier, doing all in his power, by words and actions, to soothe his last hours. This kindness was not without results. Impressed by attentions to which he had long been unaccustomed, Richard Blount—taciturn and reserved by habit, if not by nature—grew more communicative, and, at the last, made certain revelations concerning transactions of which no other living man had any knowledge. One afternoon

as the sun was setting red and broad in a burning haze behind the motionless palmettoes, and the mocking-bird was pouring forth his wealth of music by the still bayous where the alligator basked unmolested, Richard, who was feeling stronger than usual, after a period of silence and mental struggle with himself, said: "Doctor, you've been mighty good to me. You are the first person who has spoken a kind word to me for many years. I've led a hard life of it, and very likely don't deserve any better than I've received; yet I can't forget that I was once a better man, and used to kind words from those who loved me. And now, although I am both poor and forsaken, yet believe me when I say that it is in my power to make you as wealthy as your wildest fancies could desire. I was born in England; I have not a single relation now living, and to you it can be of no consequence what were the circumstances of my early life. It is enough to say that I was the younger son of a good family, and was destined to the Church, for which I was totally unfitted. I was sent to Oxford, but an insatiable

thirst for adventure caused me to run away. After various fortunes in many parts of the world, in which the cards were generally against me, it was at last my luck to find myself shipped with the crew of a pirate schooner, and a motley set we were—Spaniards, Englishmen, Frenchmen, Italians, Yankees, Greeks—men of all races. Two or three years I sailed in her, boarding and burning vessels in the Spanish Main. At length a rumour reached the nest of pirates to which I belonged that the English Government was about to take vigorous measures to capture our vessels and destroy our rendezvous. As we had for a long time been very successful, without any serious molestation, there was all the more reason to believe the report. A council of war was held, in which words ran high; but it was decided that, as our rendezvous was well known, and would most likely be attacked first, and we should be unable to defend ourselves successfully against such forces as could be sent against us, we ought at once to remove our possessions and conceal them for a while in some unknown hiding-place. With us, to decide was to act; and without further delay the treasure, which was enormous, being the accumulated spoil of many hard fights and scuttled ships, was stowed in the holds of our vessels.

A little water, surgeon, if you'll be so good.

So immense," continued Richard, after a moment, "was the stock of dollars and doubloons and jewellery, that no other ballast was needed for the schooners. When everything was on board, we set fire to the cabins on shore, and by the glare of the burning houses dropped down the lagoon and made an offing. We headed for the coast of Florida, and, the moon being at the full, shoved the schooners into an inlet, whose whereabouts was known to one of our captains, a native of Florida, son of a wecker, I think. It was a very quiet part of the country, without so many people as there are about it now. We had sent some men ashore in the morning to

find the exact entrance, and after dark they lit a fire on the beach, so we knew just where to run in the schooners. At daylight we sailed a long way up the bayou, winding about from bend to bend, with sweeps or tacking along the shore, and blazing the trees as we went along, until we came to a clearing in the woods, where the trees seemed to have been felled by a hurricane. It was gloomy and silent enough—a solitude which we disturbed perhaps for the first time. Here we made the vessels fast to the trees, and all hands went ashore. We made tents of old sails, and in a few hours, to see the smoke streaming up among the trees, and see the boys capering after squirrels and climbing after birds' nests, or flinging sticks at the alligators, you would have thought it was an old settlement."

After a brief interval of rest, Richard went on: "When the provisions and everything else had been taken out of the schooners, we hove out the ballast (you remember it was dollars), and carried it into the middle of the clearing. Each man put his share into an earthen pot; his name, written on a bit of parchment, was placed inside, and his initials were scratched on the outside; and it was then sealed up carefully. The pots of gold and silver were then buried in a circle in holes dug tolerably deep in the ground, and every man planted a small tree over his treasure. Our common stock of treasures we next sealed up in a large jar, and buried this in the centre of the circle, and planted a good sized tree over this also. After we had secured our valuables, as considerable time had been lost in doing all this, it was decided that the schooners should go off on another expedition at once; and they put to sea, leaving a few men under my charge to look after the camp and the treasure. Several weeks went by, and no news came from the absent schooners. Our stock of provisions began to run low, and it was impossible to get anything in that desolate maze of a morass, overgrown with tangled forests, and cut up by muddy streams and

bayous, especially as we had planted nothing in the clearing and had not cleared any more of the land, as we expected that, of course, the schooners would soon return with a fresh stock. We had always been so lucky that not a soul of us dreamed of any trouble. Anyhow, the schooners never came back, nor did I ever afterwards get any clue to their fate. They were probably captured and burned, or more likely foundered in a hurricane. •

The rainy season was coming on, and before long, several of our number had fallen off with starvation and disease. My comrades and I talked over the situation, and finally concluded to look out for number one, and leave the treasure to take care of itself. Well, we had a ship's boat with us, and one day, after putting a few muddy biscuits in our pockets, we took to our boat and followed the bayou until we came to the sea. Then we skirted the coast until we reached a settlement, and after that separated in different directions, for there was no tie of friendship to bind us, and we each had a sort of dread that the others might in some way betray him. For years after I wandered about the country, sometimes on the frontier, until I enlisted in the army, not caring much what became of me; but half hoping that perhaps I should be sent to Florida, as turned out to be the case, to fight these Seminoles, and so perhaps catch a chance to look up the treasure we had buried in the forest. I never had had the ready money nor, I'm not ashamed to say, the courage to go back along to that spot; but I got this shot in the leg, and here I am, and much good that treasure has done me! But it don't seem quite the thing, you see, that all that money and treasure should be buried there and be of no kind of use to anybody; and as you are the first and the last person that's been kind to me these many years, I'll trust to you to see that I have decent burial, and will tell you just how to go to find the treasure. It's all truth I've been telling you, and you needn't be afraid I'm spinning you a forecastle yarn; but just do

as I direct you to do, and it'll make you the richest man in the country, and I don't know who deserves it better." Richard Blount, after this, gave the surgeon very minute directions as to how to go in quest of the treasure. On the next day the pirate died. As soon after this as the surgeon could get leave of absence, he made arrangements with a friend to go after the supposed mine of wealth concealed in the forests of Southern Florida. He could not quite believe the story; but the circumstances under which it had been disclosed, and the fact that money had often been concealed by the freebooters of the seas, made it sufficiently probable to warrant chartering a small, light-draught schooner, and engaging a crew of blacks able to work the vessel and willing to dig in the mud after gold. It was only by a very close and tedious observation of the coast that the mouth of the bayou was found. On entering it from the sea, the line of trees which had been blazed was also discovered with some difficulty, and traced from bend to bend in the dusky light of the primeval forest. Guided by this clue, often but faintly distinguishable, the treasure-seekers, after slowly sailing along the devious mazes of the silent waters of the wilderness until they almost despaired of reaching the end in view, at last burst suddenly upon a sort of clearing in the dense mass of vegetation, overgrown with trees of younger growth, arising from which a circle of larger trees could be distinctly traced, with a central shaft lifting its feathery tuft of foliage far up into the blue sky. Tent-stakes and other relics of extinct life were also visible amid the rank grass which overgrew the soil. Everything, thus far, had proved exactly as described by Richard Blount; and it was reasonable to suppose that, as the story had been found to tally in the minute of details with facts, it would continue consistent throughout. It was therefore with renewed zest and with the burning impatience which tortures the soul when one is confident of the result, and sees the desired object almost in his grasp,

that the doctor seized a pick-axe, and, ordering his men to follow suit, broke ground in the last stage of the quest after a treasure which his fevered fancy pictured as more and more colossal as the rapturous moment approached when it would be opened to view. Such was his impatience, that he was the first to make a discovery. The point of the pick, after turning up the soft soil almost noiselessly for some anxious minutes, at last struck something hard with a most decided click. The next stroke the sound was repeated, and, at the same time, a bit of red pottery was thrown up. The doctor, perspiring with excitement, flung aside the pick-axe, and, falling on his knees, began to draw out the earth with his hands, while every one stopped his work and looked on with breathless expectation. It took but a minute to bring to light an earthen jar; but on trying to raise it they found it was cracked in several pieces, and that the bottom had fallen out. What was more important, the jar was empty! There was a disappointment to be sure! But they would not yet give up heart. There were still many jars, and perhaps this one was only a "blind"; but jar after jar was turned up, and all were found more or less broken, and not a dollar did one of them contain. Last of all the searchers cut down the central tree and unearthed the large jar over which it stood. This also, crowning disappointment of all, was in the same condition, and contained only earth-worms. Baffled, but not quite

disheartened, the treasure-seekers, as a last resource, dug several feet below where the central jar had been. They did not find the treasure they sought; but they ascertained where it had gone. They came to water, and thus discovered the solution of the mystery, and what had robbed them of the gold. They stood on a mere alluvial crust of oozy soil, under which the water percolated at some depth below. The moisture of the earth had softened the jars, and the weight of the treasure had carried away the bottoms and caused it gradually to sink lower and lower as in a quicksand, until it had dropped into the water and, of course, out of sight. There was nothing more to be done but to abandon further operations for the time, as such a result had not been foreseen, and the means for raising the money were not at hand. But the following year the doctor returned to the bayou with a pumping machine and ample apparatus for his purpose; and after much labour was partially rewarded for his trouble. Doubloons and guineas, vases and caskets of precious metals elaborately chased, the handiwork of skilled artisans of various races and ages, and gems of price which had long lain concealed in the slime of the forest, again flashed in the sunbeams. But all the lost treasure was not regained; some of it eluded the closet scrutiny of avarice or enterprise, and still lies buried for ever under the waters and the sod of Florida.



LIGHTS IN THE SEA.



EARLY two centuries have passed since the earliest English lighthouse was erected off Ram's Head, on the coast of Cornwall, by Winstanley. The old Eddystone did good service at a time when science was in its infancy, and when a lighthouse was indeed little more than a house with a light in it. It was begun in 1696,

completed in 1699, but was not destined to last long; and superstitious people saw something ominous in the fact that when it was destroyed its daring constructor perished with it. It had resisted the waves for fourteen years. But the terrible storm of 1703 proved too much for it. Attacked simultaneously by wind and sea, it went to pieces; and for some two or three years afterwards the place where the Eddystone Lighthouse had stood was marked only by ruins.

In the case of constructions and devices of all kinds out of the ordinary way, it is a common belief that the thing devised will somehow "return to plague the inventor." The maker of the Brazen Bull is reported to have been roasted to death in his own diabolical contrivance; the Russian architect who built a more grotesque church than it seemed possible that any one else could construct, was blinded, that he might not repeat his ludicrous masterpiece elsewhere; and people say to this day, in France as in other countries, that the benevolent Dr. Guillotin was one of the first victims by the decapitating machine which, to his infinite disgust, was christened by his name, and which, though not its inventor, he had, in fact, from motives of humanity, recommended for general use. A couple of centuries ago, such a lighthouse as that which Winstanley had built on the reefs and

rocks of the Ram's Head, and which he seemed to have raised up from the midst of the ocean, had a phenomenal and even a portentous aspect. He had not, indeed, built a Tower of Babel. But against irresistible natural forces he had erected what many regarded as a tower of defiance; and to these it seemed quite in the way of Providential retribution that the pretentious erection should be overturned by the offended elements, and its author crushed beneath the ruins of his own design.

But the Eddystone Lighthouse had already proved of the greatest value; and remembering how many ships and how many human lives it had helped to save, Parliament, in 1706, ordered a new one to be built at the public expense. The second Eddystone Lighthouse, constructed by Rudyerd, was finished in two years, and in 1708 was formally opened. Rudyerd's edifice, like its predecessor, seems to have been solidly built, so far as regards its capability of resisting the waves; nor did the winds of heaven prevail against it. It apparently, however, had occurred to no one that a lighthouse might possibly be consumed by fire. The second Eddystone Lighthouse perished, all the same, by flames -- a more ominous kind of destruction by far than that beneath which the first lighthouse had succumbed. The burning of the Eddystone Lighthouse was one of those catastrophes which no human foresight could have kept in view as existing even among the distant possibilities of the future. But when once the inside scaffolding and woodwork had caught fire, it was as difficult to extinguish the conflagration, as at sea it often is to put out the fire raging in the interior of a burning ship. If a lighthouse could be built to withstand the united attacks of wind and waves, it ought to be easy enough to construct one which, being far out at sea, would be in no danger of

catching fire; and the lighthouse now standing, of which the first stone was laid in 1757, and which, under the superintendence of the engineer and architect Smeaton, was completed in 1759, has at least escaped any such catastrophe as, in one shape, befel the lighthouse of 1698, and in another that of 1708. Even stone and granite, however, will not last for ever, and the rock upon which the solid masonry of Smeaton's monument is erected is beginning to give way. The millions of tons of water which for countless ages have been hurled perpetually upon the granite of the Eddystone Lighthouse have naturally done their work. The hour has come when this most solid of solid structures begins to show signs of decay. This time neither wind nor fire, but the natural enemy against which all lighthouses are especially built up, has done the harm. The sea has shaken the foundations of the building, and, to some extent, washed it away.

Under these circumstances the question has arisen whether, instead of erecting a new lighthouse, the danger which for the last two hundred years the Eddystone Lighthouse has served to point out might not itself be removed. The flame of a lighthouse is not a burning invitation, like Hero's torch, but a solemn warning of perils to be avoided; and it seemed to certain ingenious persons that if the source of the peril could be done away with, all necessity for a successor to the failing Eddystone Lighthouse of the present day would be at an end. Against this somewhat wild suggestion the Corporation of the Trinity House has reported in strong terms. The Corporation will not advise the expenditure of any further money for the purpose of blasting the rocks whose presence the Eddystone Lighthouse indicates. It did not seem worth while to consider in detail what the cost of removal would probably be. But according to the general estimate of one engineer, Mr. Douglass, it would be necessary to blow up about one hundred thousand yards of rock, or a weight of something like one million seven hundred

and fifty thousand tons, in order to get rid of the particular danger which the Eddystone Lighthouse signalises. An "inner danger," however, would also have to be dealt with; and, on the whole, a sum of at least five hundred thousand pounds would have to be spent, when it would still be necessary to erect some kind of lighthouse in order to guide vessels about to enter Plymouth harbour. The famous structure, then, must be rebuilt; and modern engineering should give us a better lighthouse, and modern chemistry a better light, than any yet seen off the coast of Cornwall or elsewhere.

Skerryvore Lighthouse is situated far out in the Atlantic Ocean, fourteen miles from Tyree, the nearest land. It is built in the form of a tower, on the Skerryvore,—signifying in Gaelic the Great Rock,—which is surrounded for miles by numerous outlying rocks. The Skerryvore is five or six feet above high-water of spring tides, and the tower rises from it one hundred and thirty eight feet. The lantern on the top of the tower is one hundred and fifty feet above high water level. Looking up at the lighthouse from the sea, it presents a magnificent sight—so lofty, so perfect in its proportions, and tapering so gracefully from basement to summit. It is constructed of immense blocks of stone dovetailed and fastened together. The three lowest courses are of Hynish gneiss, and the remainder of Ross of Mull granite. It was designed by, and erected under the personal superintendence of, Mr. Alan Stevenson, son of Mr. Robert Stevenson, engineer of the Bell Rock lighthouse.

Sir Walter Scott visited the rock, in the autumn of 1814, along with Mr. Robert Stevenson and the Commissioners of Northern Lighthouses. After humorously describing the landing, he observes in his journal, "We took possession of the rock in name of the Commissioners, and generously bestowed our own great names on its crags and creeks. The rock was carefully measured by Mr. Stevenson. It will be a most desolate position for a lighthouse—the

Bell Rock and Eddystone a joke to it, for the nearest land is the wild island of Tyree at fourteen miles' distance. So much for the Skerry Vhor."

The height of the respective towers of the three rock lighthouses referred to by Sir Walter, is as follows:—Eddystone, 68 feet; Bell Rock, 100 feet; Skerryvore, 138; while their dimensions in cubic feet are:—Eddystone, 13,343; Bell Rock, 28,530; Skerryvore, 58,580.

The erection of Skerryvore Lighthouse was authorized by an Act of Parliament passed in 1814, but so formidable did the work appear that a survey of the rocks was not made until 1835. Operations were commenced in the summer of 1838 by the erection of a temporary barrack for the workmen. The framework of this was completed in the end of the autumn, but was entirely destroyed in a storm in the following November. A new barrack was thereafter put up, perched forty feet above the rock, and was occupied for the first time on 14th May, 1840, by Mr. Alan Stevenson and thirty men.

Mr. Alan Stevenson, in his interesting account of the lighthouse, gives a graphic description of the life in this barrack. "For several days," he says, "the seas rose so high as to prevent our attempting to go down to the rock; and the cold and comfortless nature of our abode reduced all hands to the necessity of seeking warmth in bed, where (rising only to our meals) we generally spent the greater part of the day, listening to the howling of the winds and the beating of the waves, which occasionally made the house tremble in a startling manner. Such a scene, with the ruins of the former barrack not twenty yards from us, was calculated only to inspire the most desponding anticipations; and I well remember the undefined sense of dread that flashed across my mind on being awakened one night by a heavy sea, which struck the barrack and made my cot or hammock swing inwards from the wall, and was immediately followed by a cry of terror from the men in the apartment above me, most

of whom, startled by the sound and tremor, immediately sprang from their berths to the floor, impressed with the idea that the whole fabric had been washed into the sea." The work on the rock was very laborious. It commenced at four in the morning, continuing until eight, when half an hour was allowed for breakfast; after which it was carried on till two, when another half-hour was taken for dinner; and the work was again resumed and continued till seven, eight, and even nine o'clock, when anything urgent was in hand. Mr. Stevenson, after remarking that such protracted exertion produced a continual drowsiness, and that he repeatedly fell asleep in the middle of breakfast or dinner, adds, "Yet life on the Skerryvore Rock was by no means destitute of its peculiar pleasures. The grandeur of the ocean's rage, the deep murmur of the waves, the hoarse cry of the sea-birds which wheeled continually over us, especially at our meals, the low moaning of the wind, or the gorgeous brightness of a glassy sea and a cloudless sky, and the solemn stillness of a deep blue vault studded with stars, or cheered by the splendours of the full moon, were the phases of external things that often arrested one's thoughts in a situation where, with all the bustle that sometimes prevailed, there was necessarily so much time for reflection."

The excavation of the foundation of the lighthouse tower was a serious operation. A horizontal cut was, first made so as to lay bare a level floor of sufficient extent to contain the foundation pit. This operation occupied 30 men for 102 days, and required the firing of no fewer than 246 shots, chiefly horizontal, the quantity of material removed being about 2,000 tons. When the floor had been roughly levelled a foundation pit was marked out, 42 feet in diameter, on one level throughout. The pit was then excavated to the extent of 15 inches or so, and the circle prepared for the reception of the first course. This second operation occupied 20 men for 217 days.

The building of the tower was commenced

on 4th July, 1840, and the mason work was completed on 25th July, 1842. The large blocks of granite were obtained from the Ross of Mull quarry, and after being roughly formed into blocks were shipped for Hynish, distant about twenty-six miles; and they were dressed there in such a manner as to avoid the necessity of any fitting on the rock. This operation required great care, and occupied much time. For example, the dressing of each centre stone of the floors into which the others were dovetailed occupied one man about three hundred and twenty hours.

The next year, 1843, was spent in fitting up the interior, and the light was first exhibited to the mariner on 1st February, 1844.

Taking into account the money expended on the harbour for the lighthouse tender and other incidental expenses, Skerryvore lighthouse cost in its erection £86,977 17s. 7d.

The light is on the dioptric or lens system, the rays of light being deflected into the proper direction by passing through lenses of the finest glass. It is a revolving light of the first order, appearing at its brightest once a minute, and is visible for eighteen nautical miles. The lighting apparatus consists of eight large annular lenses attached to a frame resembling an octangular drum, which revolves round a fixed central lamp by means of clockwork. The lamp contains four concentric wicks, and the oil is made to flow copiously over these to prevent their being charred by the great heat evolved during combustion. The average consumption of oil in a light of this description is 760 gallons of colza or 800 of paraffin oil in a year.

There are four light-keepers attached to this lighthouse, three of whom are always on the rock, and the fourth on shore. Their families reside at the relieving station at Hynish, in Tyree. Each light-keeper remains six weeks on the rock and two on shore—a small steamer taking out to the rock the light-keeper on shore, and carrying back another to the station every fortnight, if the weather permits. The life

on the rock would seem to be very monotonous, but many of the men prefer Skerryvore to other stations. The pay is higher—the principal light-keeper's pay and allowances amounting altogether to about £120 in value—and the fortnight's holiday on shore is much appreciated.

The lighthouse consists of solid stone for the first twenty-eight feet, and entrance is obtained to it by a door at the top of this structure. The ascent to this door is by a ladder of gun-metal, which runs perpendicularly up the side of the tower; and a winding ladder inside leads to the various apartments above.

The first room, entering from the outer door, is a store for goods; the second, on the floor above, a store for coals; the third, a workshop; the fourth contains a stove; the fifth is a kitchen; the sixth and seventh are sleeping apartments; the eighth, a library; the ninth, an oil cellar; and the tenth, the light-room.

A short time previous to our visit the tower was struck by lightning. When this happened one of the light-keepers was sleeping in bed, and was suddenly awakened by a loud report, which he imagined at the moment to have been caused by the explosion of paraffin oil in the light-room. He immediately rushed there and found everything right; but the second light-keeper, who was at his post watching the lamp, had heard the report, and was also much alarmed. He then descended the tower and found the third light-keeper lying senseless on the floor of the first apartment. The latter had been standing close to the entrance door, when he was struck by the lightning and thrown to the inner end of the room. After some time he recovered consciousness, but he was quite deaf for several weeks. On examining the inside of the tower a considerable portion of the thick iron stove-pipe was found shattered into fragments, but little damage otherwise was done. Whether the lightning entered the building from above or from below still remains a mystery. But it was fortunate that the light-keeper was thrown inward

and not outward through the door, for in the latter case he could not have escaped being killed by falling on the rock below.

The light-keeper in his solitary watch in the light-room is sometimes visited by large flocks of woodcocks, thrushes, larks, and other birds. These, driven at night by wind from the land, or attracted by the dazzling light, sometimes strike against the lantern with great force and are killed. Large sea-birds also, hurried onward by the gale, occasionally strike against it, shivering the thick plate-glass to pieces, and falling dead on the light-room floor.

The force of the waves in a storm is very great at Skerryvore, exposed as it is to the full force of the wide Atlantic. Mr. Thomas Stevenson constructed a marine dynamometer which registered the force of the waves that struck it. It was found from observations made by him with this instrument at Skerryvore, that the average force of the waves during five of the summer

months of 1843 and 1844 was 611 lb. per square foot. The average force for the six winter months of the same years was 2,086 lb. The greatest result obtained at Skerryvore was on 29th March, 1845, during a heavy westerly gale, when a pressure of 6,083 lb.—nearly equal to three tons—per square foot was registered.

In the German Ocean, according to observations made by Mr. Thomas Stevenson at the Bell Rock, the greatest result obtained was a pressure of 3,013 lb. per square foot.

There is a hole in the rock at Skerryvore, not far from the landing-place, into which during a storm the surge rolls with such force that it is immediately shot out again, making a loud report like a cannon.

On leaving the rock we observed one or two sea-gulls hovering about. The light-keepers told us they gladly welcomed them, as they were sometimes the only living creatures they saw for several days together.



AN ACRE OF SILVER.

ONE of the most remarkable silver mines in California is called the "Gulch." The ore here yields from 240 to 270 ounces of silver to the ton, and lies like a coal bank in a stratification of limestone, dipping about 15 degrees. Two openings have been made at points 600 feet apart, and sufficient ore is in sight to make millions of dollars. The

owners have gone far enough to know that there is a *full acre* of the ore in the one solid body, and some conception may be formed of the amazing richness of this discovery by a brief calculation of its dimen-

sions. A cubic foot weighs 170 pounds, and, as the ore lies, 12 cubic feet make a ton. There are 43,560 square feet in an acre; and the acre of ore, being three feet in thickness, makes 130,680 cubic feet, which, with 12 cubic feet to the ton, makes 10,900 tons, worth \$250 per ton, or the enormous value in the aggregate of \$2,700,000.

The "Crescent" is another mine in which the silver is worked like a coal bed, the ore lying horizontally in the large room that has been opened, the roof being held up by heavy timbers with very stout caps and tugging poles. The ore breasts from a foot to three and four feet, and occasionally, here and there, very fine specimens of pure horn silver are found.



A NOBLE ADVENTURER.



FEW lives are more interesting to Englishmen than that of Sir Walter Raleigh; few lives have been so abounding in enterprise and adventure; few so splendid in their brilliant dawn, so sombre in their melancholy close. Raleigh is one of those few men who have both lived history and written history: his stalwart form is one of the central figures of our national history; his remarkable writings occupy an important place in our national literature. "The courtier's, scholar's, soldier's eye, tongue, sword," is a wonderfully expressive line, that suits Sir Walter Raleigh with perfect exactness. With the crowded and glorious years of his active career, the forced inactivity of those latter years in the Tower, only relieved by one disastrous episode, forms a painful contrast.

Raleigh came of an old Devonshire family, a county famous for its maritime heroes. The wealth and honours of his house were at a low ebb before Sir Walter retrieved them. We have no notices of his earlier life, and first find him in the position of an Oxford scholar. Raleigh served in France during the religious wars. Queen Elizabeth had the greatest sympathy with the struggling Huguenots, and, besides lending the Queen of Navarre money, permitted a troop of gentlemen volunteers to serve under the Protestant princes. We know that Raleigh was present at Montcontour's disastrous field, and it has been reasonably conjectured that he was at Paris on the day of the Massacre of St. Bartholomew. In the long struggle which the Dutch maintained against the cruelty and bigotry of the Spaniards the young soldier also bore part.

To Raleigh's mother belonged the high

and rare distinction that she was the mother of five knights. Three of these were her sons by a former marriage, of whom one, Sir Humphrey Gilbert, was a distinguished mariner, and had great influence on the fortunes of his half-brother, Walter Raleigh, thirteen years his junior. From his earliest years Raleigh had especially delighted in the literature of conquests, voyages, and discoveries. He had loved the stories of the discovery of America by Columbus, and of the conquests achieved by Pizarro and Cortez. It is evident that his ardent imagination throughout life was vividly inflamed by these early impressions. When his elder brother, Sir Humphrey Gilbert, told him of his schemes of American discovery and colonization, he became at once his ardent coadjutor. Sir Humphrey obtained permission of the Queen to plant and inhabit certain parts of North America which were not occupied by any of her allies. After a first voyage to Newfoundland the attractions of court diverted Walter Raleigh some time from maritime adventures. His prospects were indeed brilliant. Every one is familiar with the romantic story of how he met the Queen near a marshy spot, took off his magnificent mantle, and laid it down on the ground for her feet, and how pleased her Majesty was by this act of courtly flattery. Sir Walter Scott has turned the incident, which, if not true, is very characteristic, to admirable account in his "Kenilworth." It is no wonder that he became a favourite with the Queen, and one of the chief ornaments of the court. The portraits by which he is best known to us represent him in his court attire. They bring before us the form of a noble cavalier, in which lighter graces of manner are admirably blended with the visible impress of intelligence and genius. We see the broad forehead, the sparkling, but

withal thoughtful eye, the form tall and massive, and marked by that manly beauty to which Elizabeth always attached such high importance. In his dress, according to the fashion of the times, he strives to be rare and costly. Sometimes he has on a pinked vest flowered with pearls, and on his head a feather with a ruby. At other times he is in silvered armour, so costly and curious that it was preserved in the Tower, with sword and belt studded with precious stones. At court he formed a friendship with that mirror of knighthood, Sir Philip Sidney. Queen Elizabeth gave him some employment in Ireland, and there he formed a friendship with the great poet, Edmund Spenser.

Raleigh probably discerned that the best way to the favour of a sovereign of Queen Elizabeth's temper was to distinguish himself in high and difficult matters; and this also would best suit his own adventurous and intrepid temper. The brothers planned a second voyage to Newfoundland, and a fleet was prepared. The vessel in which Raleigh sailed was obliged to put back, as a virulent fever broke out among the crew. Sir Humphrey took possession of Newfoundland by digging up a turf, and planted the first British colony there. On the homeward voyage the brave Sir Humphrey was unfortunately lost. Raleigh, however, persisted in the schemes that had been planned. He obtained letters patent from the Queen to "discover such remote, heathen, and barbarous lands as were not actually possessed by any Christian, nor inhabited by any Christian people." At this time European knowledge respecting the northern continent of America was of a most unsettled and limited kind. Various pilots, who had sailed in the Spanish waters off Mexico, had told him that, returning by the Havannah and the Gulf of Florida, they had observed a continued coast stretching far away to the north-west. It occurred to Raleigh that, as the Spaniards had settled the middle and southern parts of America, so there must be vast tracts to the north reserved for himself and the English. At

his own charge he fitted out two vessels, which were despatched according to what was then the usual route, by the Canaries and the West Indies. The captains of Raleigh's vessels reached Florida, of which they took possession in the name of the Queen, and Elizabeth commanded Raleigh to call the new acquisition Virginia. Virginia accordingly became a common name for all the coasts of North America colonized by the English, and subsequently was limited to the district now so called. Raleigh's Virginia was in fact Florida. He was now in the brilliant culmination of his fortunes. Queen Elizabeth knighted him, and this great Queen considered that knighthood from her hands was superior to any barony. His native county elected him Member of Parliament. The Queen gave him lands in Ireland, monopolies in England, made him Seneschal of her duchies, and Lord Warden of her stannaries. In the meantime Raleigh, amid his diversified employments, steadily devoted so many hours a day to study, and distinguished himself also by the manner in which he fostered literature and the arts. In the midst of all this greatness, imputations of favouritism were heard, and the Queen was even told that "Raleigh was of too much and too intolerable a power." Perhaps there was something in his manner, or aspiring ambition, or sudden rise, that to the wise and wary was of evil augury. When the sagacious Burleigh drew up his instructions for his son, he wrote, "Seek not to be Essex: shun to be Raleigh." We are now, however, at the most glorious portion of his career, where the biography of Raleigh becomes part and parcel of the history of England. We doubt not all our readers are familiar with that stirring episode in English history, the destruction of the Spanish Armada, and will recollect how Sir Walter Raleigh, with the other notable sea captains of Queen Elizabeth, repulsed the Spaniards, and how in very truth "the stars in their courses fought against Sisera."

Soon after this we find the adventurous

Raleigh, whose career so often reminds us of the knight-errantry of the old romantic type, in the kingdom of Portugal, aiding Don Antonio against the hostilities of the King of Spain. Some time after his return he fell into well-merited disgrace, from scandalous circumstances, and by the Queen's orders he was committed into custody for some months. He was not long, however, in regaining lost favour. Those were days in which England could ill spare the services of so gallant a son. News came that the Spaniards were making preparations in their ports for a second Armada. The Queen determined to be the first to attack, and sent out an armament on a secret expedition to Cadiz. The gallant, headstrong Essex had the chief command of the land forces. Raleigh commanded a squadron under the famous Lord Howard of Effingham, the admiral. Lord Clarendon calls this expedition to Cadiz "Raleigh's fortunatest piece." On his return home Raleigh projected those vast Guiana designs which were hereafter to shroud his path in perplexity and darkness. Guiana was a region which the Spaniards, amid all their schemes of conquest and colonization, had hitherto left untouched. In his dedication to the "History of Guiana" Raleigh says that "many years since he had knowledge, by relation, of the mighty, rich, and beautiful empire of Guiana, and of that great and golden city which the Spaniards call El Dorado, and the naturals Manoa." Raleigh himself determined to set off in search for El Dorado, that splendid vision which so baffled the adventurers of the age, and, like the translucent waters of the mirage, retreated for ever before them in the despairing distance. Many persons believed, in the existence of this fabulous city, Manoa, and of the Lake Panama, of which the sands were pure gold. On this occasion, when Raleigh reached the coast, he was told that Guiana was six hundred miles farther from the sea than he had been before informed. He thought it best to conceal this new information from his

companions. He left his ships at anchor, and taking the small barges, and an old galley, went on for four hundred miles. Unfortunately he had neglected to take with him the proper mining instruments for testing the value of the mineral productions. On his way several petty princes surrendered, to whom he showed the portrait of Queen Elizabeth; and, as a sure means of pleasing the Queen, he says, "They so admired and honoured it, as it had been easy to have made them idolatrous thereof." The lateness of the season, and the overflowing of the rivers, prevented their further progress. He returned home, having effected little more than some exploration of the country.

On his return he published his celebrated account of the expedition to Guiana. This has given rise to a considerable amount of controversy, which has generally, and, we think, unjustly, been unfavourable to the memory of Raleigh. The expectations which he holds out are brilliant, but not more so than those which really tintured his own mind. "For the rest, which myself have seen, I will promise these things that follow and know to be true. Those who are desirous to discover and to see many nations may be satisfied with this river Orinoco, which bringeth forth so many arms and branches, leading to several countries and provinces, about two thousand miles east and west, and eight hundred miles north and south, and of these the most rich, either in gold or in other merchandises. The common soldier shall here fight for gold, and pay himself, instead of pence, with plates of half a foot broad, whereas he breaketh his bones in other wars for provant and penury." He speaks, too, of the hills sparkling "with stones of the colour of gold and silver." The veracity of Raleigh has been very strongly impugned. This was the case even in the time of Queen Elizabeth; still more so, and under tragic circumstances, in the next reign, and in the times that have succeeded quite as much. Sir Richard Schornburg, in his preface to "Raleigh's Guiana," points

out, as clearly proved, that the Indians themselves were deceived, as well as deceivers. The Indians showed small quantities of gold, and spoke of the existence of gold in the neighbourhood; and was Raleigh to be blamed for trusting to those indications which had led on the Spanish adventurers to unheard-of wealth? The vision of Manoa held forth nothing incredible to those who were familiar with the exploits of Cortez and Pizarro, and with the conquests of Mexico and Peru. We may add that the whole story of Raleigh's latter career is contradictory and unintelligible if we suppose that he hazarded fame, fortune, and life itself for what he knew to be a figment, but perfectly rational and consistent on the simple and satisfactory hypothesis that he acted in good faith.

The Island Voyage, the troubles in Ireland, the Earl of Essex's treason, are among the principal events of the remainder of Elizabeth's reign; and in all these Sir Walter bore his share, and in such a manner as to retain the favour of the Queen. She showed her sense of his fidelity by making him Governor of Jersey. In 1603 the great Elizabeth died. In the setting of "that bright occidental star" arose clouds and darkness, which soon involved Sir Walter in impenetrable gloom. The title of James I. to the crown of England was not without a manifest flaw; and it has been conjectured that the splendid military fame of Sir Walter alarmed the monarch, and that his great literary fame piqued the pedant. The arts of Robert Cecil, who had once been his friend, were insidiously exerted to poison the mind of the new King against him. Raleigh was guardian of a young lady named Bassett, a descendant of the Plantagenets, betrothed to his son. The jealousy of James took alarm, and he tyrannically forced her to marry another person. In the first year of the new reign mysterious plots broke out, which have never yet been thoroughly sifted and intelligibly stated. The presumption is, that Raleigh was concerned.

Lord Cobham, being arrested for treason, declared that all which he had done he had done by the instigation of Raleigh. Sir Walter was committed to the Tower. The unhappy man at once gave himself up for lost. He knew, as he himself has expressed it, the cruelty of the law of England. That law, now the most scrupulous and fair in the world, during the Stuart dynasty was in a most disgraceful state as relating to all cases of treason, and rendered it most difficult for the most innocent person to obtain an acquittal. In his rage and despair, whether feigningly or not, he endeavoured to stab himself to the heart. Raleigh was not to die then: he was to learn, through long and bitter suffering, the impiety of such an attempt. The Plague then raged in London, and, sparing hardly aught else, it spared the Tower, where the prisoners of state were confined. The trial came on at Salisbury. Whether or not Raleigh was really guilty is a matter of doubt, and his own subsequent silence is unfavourable. But of this there can be no doubt at all, that the evidence utterly failed to bring home the truth of the charge. Cobham's passionate accusation had been fully retracted, and his wavering contradictory evidence was in any direction quite worthless. The prosecution indulged in scurrilous invective and abuse, but there was no pretence of evidence. Judge and jury, however, knew well that they were there to beg a foregone conclusion. The jury, not without visible reluctance, to the great disapprobation of the spectators, returned a verdict of guilty; and the sentence of death, with all the barbarous adjuncts then usual, was passed upon the prisoner at the bar.

Sir Walter Raleigh was sent back, a condemned felon, to the Tower. Year after year he was to linger there. What a change was that for the great sea captain! Hitherto he had been free as air, and had delighted in his own conscious energy and strength: now he was a prisoner in the fatal Tower, fully expecting his execution.

Thus her husband endeavoured to con-

sole his faithful wife : " Let my sorrows go into my grave with me, and be buried in the dust. And, seeing it is not the will of God that ever I shall see you more in this life, bear it patiently and with a heart like thyself. . . . Thy mournings cannot avail me : I am but dust. Remember your poor child, for his father's sake, who chose you and loved you in his happiest time."

King James continued, with cruel caprice, to make Raleigh languish in intolerable suspense. The sentence was unexecuted, and for long years Raleigh remained a prisoner with the axe suspended above his neck. Lady Raleigh knelt in vain before James : the King passed her in unfeeling silence. By-and-by the rigour of his imprisonment was relaxed, and his wife was allowed to be with him. A son was born to him in the Tower. The King confiscated the greatest part of his property, to confer it on a worthless minion. " I mun have the land ; I mun have it for Carr." It has been truly said that Raleigh converted the Tower into a temple of the muses. To beguile his imprisonment he projected his gigantic undertaking, " The History of the World."

It is now known that several learned coadjutors assisted him ; but the genius, eloquence, and glory of the work is all his own. Mr. Hallam observes respecting this celebrated work, that Sir Walter Raleigh is " less pedantic than most of his contemporaries ; seldom low, and never affected." Hume says of him that " he is the best model of our ancient style." He writes as we should expect a man to write who enjoyed the companionship of Shakespeare, Spenser, and Ben Jonson. Only the first part was completed, bringing the work down to the end of the second Macedonian war, one hundred and fifty years before Christ. It was his intention to have completed two more volumes, of which he says, " I have intended and hewn out ;" but the death of Prince Henry, to whom the work was dedicated, " besides many other discouragements, persuaded him to silence." One of these discouragements was the

comparative neglect with which the work was received ; a fate which has befallen various great undertakings. Somewhere in the depths of the work Raleigh has given the portrait of James as a pattern king, ably putting forth the favourable side of his reign, and with a flattery which only his dire necessities could excuse. We wonder if James ever read it. Most likely he did, the pedant ! but the passage would have no influence, no more than Prince Henry's regard for Raleigh, or the continual intercession of his wife, Anne of Denmark. When Sir Walter Raleigh was at last enlarged, this was effected by means of a heavy bribe given to the new favourite, Villiers.

In 1615 Sir Walter Raleigh was released. He was an old man now, but not too old, he hoped, to achieve something that might regain wealth and honours. He revived the old unhappy Guiana scheme. He must long have brooded over it in those weary years in the Tower, and have longed in his prison to be once more on the broad waters and beneath the blue heavens. Raleigh never ceased to bring the subject before the attention of the Secretary of State, Winwood, and completely dazzled him with the splendour of his designs. The King gave permission. At this time the King was completely under Spanish influence, and the Spaniards naturally viewed with alarm any such projected undertaking. Gondomar, the ambassador, strongly protested. The King feebly hesitated between his cupidity and his fear of offending Spain. He limited Raleigh's patent, only giving him power to trade with savage or infidel nations, and forbidding any offence against the King of Spain. He also demanded a written statement from Raleigh of the amount of his force, its object and destination. The King had the incredible folly or wickedness to put this paper into the hands of Gondomar. The Spanish ambassador sent off a copy of the document to the governor of St. Thomas, and Spanish soldiers were also provided in abundance, that the adven-

turers might receive a murderous reception.

We do not care to dwell on the details of that shameful and melancholy story. It will be remembered how the expedition proved an utter failure; how the Spanish fleet hung in their rear; how the town of St. Thomas was taken, where Raleigh's eldest son, his pride and hope, was slain; how there was a disastrous retreat; how his fleet displayed a mutinous spirit; how his subaltern, Captain Keymis, in grief and despair destroyed himself; and how Raleigh himself was taken into custody. He might have suspected that his life would have been in imminent danger had he returned to England. The means were found whereby he might easily have gone over to France. At the proper time he fatally vacillated, and when he subsequently attempted to escape he was betrayed by his confederates.

The Spanish ambassador insisted that vengeance should be exacted. King James was then full of his irreligious and unpatriotic scheme of marrying his son Charles to the Infanta of Spain. He could refuse nothing to Gondomar. It was resolved that Raleigh should be put to death according to his old sentence, a sentence of fifteen years' standing. Raleigh pleaded that in his recent expedition he had held the King's commission under the great seal, and that this was tantamount to a pardon. In justice this plea was perfectly conclusive. He had even consulted Lord Bacon about it before he last sailed, and Lord Bacon assured him that his commission was a legal pardon. The Court of King's Bench, however, told Raleigh that all these years past he had been a dead man in the eyes of the law, and that, since execution was prayed for, they must award it.

There remained just one chance of saving his life, and that was, to make an appeal to Gondomar, the all-powerful Spanish ambassador. This, however, Raleigh steadily refused to do. He wished for a little delay, and, this being denied, he cheerfully prepared for death. "The world," he calmly said, "was but a large

prison, out of which some were daily selected for execution." Dr. Tonson, the Dean of Westminster, was appointed to attend him. "He was," says this clergyman, "the most fearless of death that was ever known, and the most resolute and confident, yet with reverence and conscience. When I began to encourage him against the fear of death, he made so slight of it that I wondered at him. When I told him that the dear servants of God, in better causes than his, had shrunk back, and trembled a little, he denied not, but gave God thanks he never feared death, and much less then." Raleigh also told him that "no man that knew God, and feared Him, could die with cheerfulness and courage except he were assured of the love and favour of God towards him." He spoke at some length on the scaffold, concluding his remarks thus: "And now I entreat you all to join with me in prayer to the great God of heaven, whom I have grievously offended, being a man full of vanity, and have lived a sinful life in all sinful callings—for I have been a soldier, a captain, a sea captain, and a courtier, which are courses of wretchedness and vice—that God would forgive me, and cast away my sins from me, and that He would receive me into everlasting life. So I take my leave of all you, making my peace with God." He desired the executioner to show him the axe. The man hesitating, Sir Walter said, "I prythee let me see it: dost thou think I am afraid of it?" He passed his finger along the edge, and said to the sheriff, "This is a sharp medicine, but it is a cure for all diseases." Having given his forgiveness to the executioner, and entreated the prayers of the beholders, that God would strengthen and assist him, he laid his head on the block.

Thus, then, died Sir Walter Raleigh, than whom none filled a larger space in the history of his age and country. Pre-eminent in daring, genius, and glory, he was pre-eminent in suffering, in disgrace, and in the tragedy of his doom. His active career is not without the suspicion

or the stain of ambition, craft, and cruelty. As we have seen, we are not without evidence that that proud spirit was humbled by his fall, and that the slow sad years brought amelioration and peace. In this better hope we leave him. We cannot conclude better than with the verses found in his Bible, and a copy of which he is said to have given away the night before his execution. In the whole compass of

English literature there is no more touching fragment :—

“Even such is Time, that takes on trust
Our youth, our joys, our all we have,
And pays us but with earth and dust ;
Who in the dark and silent grave,
When we have wandered all our ways,
Shuts up the story of our days :
But from this earth, this grave, this dust,
My God shall raise me up, I trust.”

INSECT SAPPERS AND MINERS.



MOST interesting account of the singular habits of the termites, or “white ants,” has been given by Mr. Smeathman, an English naturalist.

They have generally been called “ants,” probably on account of the similarity of their manner of living, and their skilful and diligent labour ; but they are by no means the same kind of insects. They certainly not only equal but excel ants, bees, wasps, and beavers, in the art of building ; and, if we take into account the comparative size of the architects, we find, on comparing the hillocks constructed by these insects with the most colossal works of man, that the result is calculated to awaken in us sentiments of humility. The Great Pyramid of Cheops, in its original state, before the base became covered by the accumulation of sand, was about 480 feet in height. It was, therefore, about ninety-six, times the height of a man, assuming the average stature of Africans to be five feet. The hillocks which the termites raise are about a thousand times higher than the insects which construct them ; so that these edifices of the white ants are, relatively, many times higher than the loftiest of our monuments.

These artificial mounds are surprisingly

strong ; they are but of small circumference, compared with their height, and when finished are pointed at the top, so that you might imagine, to look at them, they could be blown down by a violent wind ; but, in reality, they are proof against most assaults. While they are still in the course of construction, and when their domes are accessible to the wild bulls, these animals may often be seen standing on their summits, as sentinels to the rest of the herd ; and Mr. Smeathman assures us that he and his companions were in the habit of climbing up them in order to survey the surrounding country. In some regions, their magnitude, regularity, and numbers make them resemble an assemblage of negro huts. “They rise from eight to ten feet high, with a smooth surface of rich clay, excessively hard and well built.” Situated in the centre of the ground worked by each colony, these edifices may be said to constitute the capital of the community ; and, like our own large cities, they have their public streets and squares, through which a numerous population is constantly passing to and fro ; their magazines always well filled with provisions ; their nurseries, in which new generations are reared by the care of the community ; and lastly, the palace of their sovereigns, who are, in truth, the actual father and mother of their subjects.

This description applies to the nests of the *Termes bellicosus*, which is the largest of

the species. There exist at least twenty-four different species of these insects, nine of which belong to Africa, nine to America, two to Asia, and two to Europe. All the various species are miners, and most of them, moreover, are architects. Some among them build their nests on trees, around a large branch, which they carefully preserve, when it suits their purpose. These

nests are often as large as a sugar-barrel, and though exposed to the storms of the tropics, and composed entirely of small pieces of wood, glued together by means of the gums of the district and the juices yielded by the workers themselves, they are never torn away.

Almost all the various species work out of sight, constructing, above their subter-



anean galleries, buildings which contain their nurseries and storehouses. Two kinds are found to erect column-shaped nests, surmounted by a roof or dome, which projects on all sides; they are generally about three-quarters of a yard high, and a quarter of a yard wide. They are formed entirely of clay, tempered to surprising hardness, so that it is easier to tear one of the columns up from the base than to break

it off in the centre. Nest after nest rises, as the colony increases, till at length the whole resembles a bed of gigantic toadstools.

Like the majority of insects, the termites proceed from an egg, and pass through various stages before attaining perfection. In every nest there are found larvæ, nymphs, and perfect insects, accompanied by an immense number of neuters. The latter

fulfil the functions of soldiers, and are exclusively occupied in watching over the common safety, as well as in maintaining good order. The larvæ and nymphs are by no means idle during their transition state, but perform all the labours required in the community. In fact, they build the dwellings, dig the excavations, amass the provisions, and attend upon the common mother, whose eggs they receive and take care of. Though so much work devolves upon them, they are of very small size. The workers of the *Termes bellicosus* are not larger than our common ants, which they so much resemble that the Creoles and most travellers still call them by that name. Their whole body is of such extreme delicacy that the slightest touch crushes them; but their head is provided with sawlike mandibles, of so strong and horny a substance as to enable them to attack the hardest bodies, excepting only stones and metals.

The soldiers are about twice their length, and weigh as much as fifteen of the workers. This weight is owing to their enormous horny heads, which are much larger than their bodies, and armed with sharp pincers, true weapons of offence, quite unfitted for the purposes of ordinary labour. These preserve, through the whole of their lives, the characters and attributes which have obtained for them the name of soldiers. Although they hardly number one hundredth part of the whole insect population, they constitute a distinct class, which may be compared to the nobility of a monarchy, while the larvæ may be looked upon as the plebeians of the community. At ordinary times, they live in idleness, merely keeping guard, or watching the labours of the workers, over whom they evidently exercise authority. In times of war, they show the utmost valour, attacking the enemy, and are ready to sacrifice themselves, if needful, for the common safety. No sooner is the first blow struck against one of their edifices, than the nearest sentinel is seen to hurry forward. The alarm is given, and in an instant a crowd of combatants hasten to

the point of attack, moving their heads in all directions, and opening and shutting their forceps with a loud noise. When once they have fixed these formidable weapons into any substance, nothing can make them loose their hold. They will be torn piecemeal without unlocking their jaws; and woe betide the unfortunate hands and legs which are unprotected from their gripe. They at once draw blood; so that the negroes, who are without shoes and only half-clothed, are soon put to flight, and even Europeans who venture to assail their strongholds do not come off without formidable wounds.

While they are thus engaged in fighting, the soldiers, with their forceps strike the ground from time to time, and this well-known sound is immediately answered by the labourers, who reply to it with a sort of whistling or hissing noise. As soon as the attack ceases, the fighting men retire, and the masons come out in crowds, each bringing in his mouth a piece of clay, ready prepared. Each in turn applies his portion of mortar to the place that needs repair, and then makes way for another, who does the same; and thus the breach is repaired in a surprisingly short time. While this is going on, the soldiers remain in the interior, excepting one or two to every thousand labourers. One of them appears to be charged with the superintendence of the works, for during the building of a wall he stands at his post, slowly turning his head in all directions, and striking the dome rapidly every few minutes with his forceps, which produces a sound somewhat louder than the ticking of a watch. This is responded to by a hissing noise, which seems to resound from all sides of the building, and is invariably accompanied by signs of increased activity among the labourers.

If the attack be renewed, instantly the workmen disappear, and the soldiers replace them in a twinkling, contesting their ground with the utmost tenacity, and defending it inch by inch. Nor are the labourers meanwhile unoccupied; they block up all the passages and galleries which lead to the

various apartments, especially the 'royal chamber, which they do so artfully that Smeathman, on reaching the centre of one of these edifices, was unable to distinguish it from a shapeless mass of clay. The vicinity of the palace is betrayed, however, by the great crowds of faithful lieges who collect around it, and who allow themselves to be crushed rather than abandon their charge. They even permitted themselves to be taken captives with the royal pair, and when placed in a large glass bowl, were seen incessantly engaged about the person of the queen, giving her food, and removing her eggs, which they carefully piled up in some corner, or retired part of the vessel in which they were imprisoned.

Without destroying their works, it is scarcely possible to get a view of these insects, as they invariably keep below ground, save on peculiar occasions; all the nests having subterranean galleries, which radiate in all directions, and often to very considerable distances from the point of their origin. Even the tree termites construct a long tube which reaches to the ground, and serves as the centre of their covered roads. All the species, too, have the same habits, and their innumerable hosts are incessantly on the watch for some substances on which to prey. It is this instinct which makes them so formidable to many, that Linnæus did not hesitate to designate them as "the greatest scourge of the Indies." Hidden from the view of those whom they threaten, the termites undermine the very walls of store-houses and dwellings, and make their way up into the interior. Some attack the wood-work, others the furniture and provisions of every sort, whilst others demolish the floors and roofs; but, being always careful to avoid the light, they never work their way to the surface of the objects they consume, but content themselves with gutting the interior. Their work of destruction progresses with such amazing rapidity, that one season suffices for the entire destruction of an European house, while a negro village completely disappears within the same

period. They have been known to penetrate, in a single night, through the foot of a table, and, ascending the leg from the ground upwards, to attack a box which stood upon it, and so completely to destroy the contents, that next day not an inch of the clothing it contained remained intact, and even papers and pencils, including the lead, had all disappeared in the same time.

So skilfully do they leave the upper sheets and the margin of each leaf entire, that the eye is perfectly deceived, and a mass of crumbling substance has the appearance of a pile of papers in perfect order. In the same way the whole interior of oak posts will crumble under the touch, while externally they look perfectly sound, the layer left untouched by the termites not being thicker than a sheet of paper.

The marching termites are no less curious than the warlike species. They seem to be much scarcer and larger than the other. Our traveller was fortunate enough to see one of their armies march by him. He says: "One day, on my return through the thick forest, suddenly I heard a loud hiss. This noise caused me to move a few paces from the path, where, to my great astonishment and pleasure, I saw an army of termites coming out of a hole in the ground, which could not be above four or five inches wide. They came out in vast numbers, and seemingly as fast as they could possibly march. In less than a yard from the place they divided into two columns, composed chiefly of the labourers, twelve or fifteen abreast, and crowded as closely as sheep in a drove, going straight forward, and among them, here and there, a soldier was to be seen. While these were hastening along, a great many soldiers appeared, spread about on both sides of the two lines of march, some a foot or two distant, standing still or sauntering about, as if on the lookout for any enemies who might assail the labourers. But the most extraordinary part of the march was the conduct of some of the soldiers, who, having mounted the plants which grew here and there, had placed themselves on the points of the leaves,

which were raised ten or fifteen feet from the ground, and overlooked the army marching below. Every now and then one or other of these would beat with his foreceps upon the leaf, making a noise similar to that described among the warrior species. This signal produced the same effect upon the marching white ants; for instantly the whole army returned the noise, and obeyed by increasing their pace with the utmost haste. At length the two columns united into one, and then descended into the earth by two or three holes. They continued marching by me for above an hour, as I stood admiring them, without any diminution of their numbers."

Towards the beginning of the rainy season, these insects attain their perfect state. Their form and size are then much altered, and they are furnished with four large transparent wings, with which to wing their way in search of a new settlement. Some stormy evening is usually selected for the period of their flight, when they issue by millions from their subterranean retreats. Their aerial life is, however, of very short

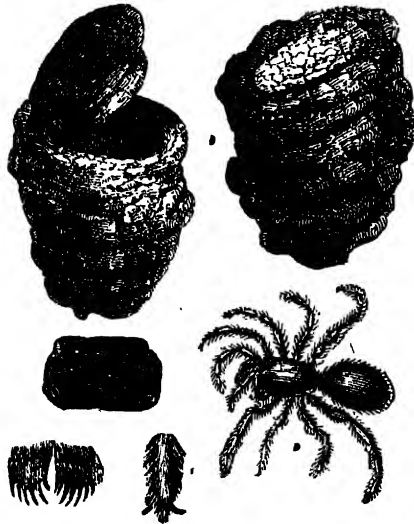
duration, for, after a few hours, their wings wither and fall off. On the following day the earth appears thickly strewn with the bodies of these helpless insects, which then become a prey to innumerable foes. Only a small number escape, and, reaching a place of safety, form the foundation of a new community.

All travellers speak of ants being used by certain nations as food; but this is only the case with reference to the termites; and there is no doubt that these insects are eaten by the natives of Africa, as well as by

the Indians. However strange it may appear, this extraordinary kind of food seems to be relished even by Europeans, and travellers agree in describing it as savoury and agreeable, resembling in flavour sweetened marrow or cream. Smeathman pronounces them a delicate, nourishing, and wholesome food, and he seems even to prefer them to the famous palm grubs, which, in the West Indies, are brought to the tables of the rich as an exquisite delicacy. Surely the riddle of Samson aptly applies to these destructive insects, "Out of the eater came forth meat."

In his wanderings in Africa, Livingstone

repeatedly met with these destructive little pests. On one occasion he says: "The soil teemed with white ants whose clay tunnels, formed to screen them from the eyes of birds, thread over the ground, up the trunks of trees, and along the branches, from which the little architects clear away all rotten or dead wood. Very often the exact shape of branches is left in tunnels on the ground, and not a bit of the wood inside.



The first night we met with them they ate through the grass beds and attacked the blankets, and certain of the large red-headed ones were equally ferocious. The hands and neck were the first objects of attack. It was as hard to sleep in the hut which they attacked as in the trenches before Sebastopol. "A man may be rich to-day and poor to-morrow from the ravages of white ants," said a Portuguese merchant. "If he gets sick, and unable to look after his goods, his slaves neglect them, and they are soon destroyed by these insects."

A VISIT TO WOOLWICH ARSENAL.



WOOLWICH is marvelous, colossal, amazing, glorious; but emphatically it is not beautiful. The Arsenal, strange to say, is the prettiest part of it. In summer, when the trees are out, its courts and esplanades would be almost rural if one could keep one's eyes from the dingy brick around, and the rows of black cannon at one's feet.

After delivering your "pass" at the gates, a military guide will take you into the Royal Laboratory, where they make bullets, and fuzes, and gauges, and rockets, where they "squirt" lead and do five hundred things with five hundred lathes, which endlessly rattle and revolve around. Here is a sanatorium for aching heads. The very roof seems to be in motion, so thick and so fast the bands spin round. Nine hundred men and boys are here at work in the largest shed of Christendom; 4070 feet of shafts revolve with the motion of two pairs of large engines. In a small apartment at the end, hydraulic presses squeeze out solid lead like wire, and men carry it rolled upon a wheel to be cut and punched into bullets by machinery. Elsewhere are making the clay plugs, which have superseded box-wood, to expand the bullet. Machines of great ingenuity stamp out these little cups from clay dry and powdered, which is pressed to the hardness of stone. As the bullets come rolling down, bright as a silver cataract, at each of the hundred little tables, boys press in the plugs and others carry them off to realms inaccessible, where they are fitted in the cartridge cases. Here fuzes are being made, wooden and metal, time and percussion. There, rockets, long rolls of iron painted red, with flanges at the

base, like a ship's screw. The gas escaping at discharge works upon these wings, causing the rocket to revolve. At another series of lathes and whirling bands thin sheets of brass are being corrugated for powder cases. Everywhere is motion and bewildering busyness. About 4000 hands are employed in this branch alone, and two million cartridges are turned out per week. There is machinery set up sufficient for three million, and machines in store to furnish a quantity undetermined.

Across the yard, in the building which was once Prince Rupert's Palace, is the Pattern Room, or Museum, of the Laboratory. To right of the entrance, in a fine apartment, shells of every size are ranged and neatly ticketed with their weight, character, and peculiarities. Here are the remains of the 800 pounder which pierced three 6½-inch plates and ten inches of teak beyond. All the shells are displayed, first whole, next cut into sections, and lastly in fragments, to show their structure. In a small room, once Prince Rupert's dining chamber, as tradition goes, are torpedoes of every kind, the long shining Whitehead, vastly improved on the inventor's model, the stationary torpedoes like buoys, and that which travels parallel to a vessel's course, as a fishing "otter" does. All of them are charged with gun-cotton, the Whitehead taking 500lb. in its deadly skull. Accredited rumour has it that the sole use of this terrible invention was offered to the late Government for £15,000, and refused. It has cost us £40,000 now to obtain a share, which is likewise held by every naval Power in Europe, excepting Russia.

The large yard about these buildings was full of round shell, uncharged, of course, not many months ago. Round shell is now as ancient as bows and arrows, and the Government has found an excellent store of iron waiting to be converted to better uses.

In the foundry near by, we see these antique shells being cleft in two by a hammer and a wedge, to be re-melted. And we also see them reappear in modern shape, or in the more deadly Palliser. This workshop is full day and night, with never a rest. The famous working man who dwelt in "Podgers's Birth-Place" would be uncomfortable here, for his burly fellows get no dinner hour. They begin to work at six a.m., and never cease till four p.m., when the shift arrives; of such importance is it to work out the furnaces when they are once heated.

Why smelting sheds should always look ruinous is a question. At Woolwich they boast their own a picture of neatness, and perhaps it may be in comparison. There are certainly no holes in the roof, nor are the blackened pillars chipped and burnt out of shape as at other works. But there is the same out-at-elbows look in a smaller degree. Probably the men do not notice their surroundings, toiling as they do in a lurid glare of burning furnaces, red hot moulds, with twilight beyond the radius.

The casting of the great Palliser shell draws most attention. By an open furnace stand the moulds, solidly fixed upright in the ground. The material is sand compressed, with a hollow cone of iron at the base. The molten metal is poured in, and that which fills the cone chills rapidly, whilst that in sand takes a much longer time. In the result the point becomes so hard as to pierce like steel, and the body of the shell so brittle that with the tremendous impact it explodes in a shower of fragments. This is the great but simple discovery of Major Palliser. They are making shells for the 25-ton, the 35-ton, and the 80-ton guns in this foundry, and a fine sight it is. The flame-white metal smoothly rolling from the furnaces, the iron trollies carrying it about, the crane moving swiftly and silently from one to another, the burly smiths feeding their moulds, aflame with red light behind, dark before; the clank of iron instruments on the iron floor, the roll of heavy wheels and clang of distant hammers—all these sights and sounds of

Pandemonium have been described a thousand times, but they affect one scarcely the less.

In the next building finished work is stored—rows, piles, heaps of shell of every size, wide-mouthed, gaping for their fuze, wickedly pointed, lying flat, stacked in rows, suspended with chains in air. The place is full of shining machinery, always on the move. Dirty giants in wooden shoes and paper caps tinker endlessly with bars and hammers, or drag trollies full of metal white-hot. The shells are every size, from that huge fellow preparing for the *Inflexible* to the little nine-pounder of the smallest field-piece. Upon a monster roll of iron, four feet high, to fit the chamber of the 80-ton gun, some man, with an eye for contrast, has balanced the least of all, scarce six inches long.

From this enormous shed one passes into the gun-room. It chanced to be almost deserted for the moment, and the huge things lie in silent majesty. As the visitor at such a time passes up the vast museum he cannot but fancy himself surrounded with the forms of awful creatures alive before the Flood. No drawings can give a true idea of size in this case, nor will figures help one. A man must see for himself, and shudder. Two 80-ton guns lie upon their platforms at the end of the room, with the machines, hardly less gigantic, which rest awhile from the operation of boring them. Along the room smaller monsters are arranged, of 38, 35, and 25 tons. "Jackets," belonging to them, yet unfitted, stand like small towers on end. If we say that the 80-ton gun is 27 ft. long, 6 ft. diameter at the jacket, and throws a shell weighing 1700 lb., we really give measurements quite useless to convey a sense of its magnitude; the awful thing must be seen. In a shed near by they are planing the "jacket" or breech-strengthening of one of these guns. As it comes from the casting it is rough and incorrect in form, and here we see it being reduced to symmetry. The enormous mass revolves slowly against a plane of steel,

which shaves the solid metal in ribbands, inches broad and half-an-inch thick sometimes. This is the gun-boring room, where giant skeletons lie tossed about like masts in a shipbuilder's yard, or like fossil monsters on the coast of a palæocretic sea. Outside there are more of them, finished and ready for their work, a terrible show.

But it is enough to watch three grand operations—rolling the bar, coiling it into gun shape, and welding it beneath the 40-ton hammer. To see the first of these one visits the Rolling Sheds, where two huge engines, of marvellous flexibility in reversing, drive four pair of massive rollers, destined to squeeze an unlicked mass of iron into shape. In the furnaces all round rough layers of plate iron, ten inches broad and deep, eight feet long, are softening and fusing into one another. The door rises, and from the glowing cave within a white-hot carcass slides upon the truck pushed forward to receive it. A dozen men cheerily run it to the largest roller, and thrust the end within its grip. The engines give a louder snort, perhaps, but that is all. A rain of fire spurts about—the bar vanishes in those black jaws. It comes out on the other side, reduced one-third of its diameter, and proportionately increased in length. Another truck catches it, wheels it round with a laugh and a cheer from those big fellows at the shafts. Clash! The engines are reversed, and it passes under the next machine, and comes out longer and thinner still, to enter the third roller, and pass back by the fourth. So they make a bar of wrought iron, and the visitor departs to see the bar transformed into a coil.

At another vast shed, full of furnaces, huge hammers, and machines, this operation is performed. The wealth of England enables her to make the finest of weapons. To others she can leave the bronze and the compositions, which are not best for cannon-founding, but are cheapest. All nations would use wrought iron if they could afford it, but we alone do use it. Our guns are made of a bar such as that just described, coiled spirally, and welded into a solid mass

by the hammer. In this building the coiling is effected. These red-hot furnaces contain a straight bar; at a word the door is slightly raised, and with huge nippers its head is seized by loops made for the purpose. A steam winch draws out the glowing mass and brings it to a horizontal capstan fixed before the door. A water hose is turned upon the loop, and whilst it blackens under the chill a stalwart smith, wielding a great sledge hammer, fixes the loop upon a nut projecting from the capstan wheel. Then the machine revolves with resistless force, curling the white-hot metal round and round upon its "drum," neatly and smoothly as a girl winds riband. So the coil is formed, whether for the breech piece, or the body of the gun, or for its "jacket." This, again, is cooled, and after awhile re-fired for welding under the hammers.

The "great heat" they call this last operation of the furnace, and it is performed close by the Nasmyth hammer of forty tons sheer weight—if it be a piece worthy to be treated by that giant of machines. It rises in the midst to a height of forty feet, and they tell you there is depth as great under the iron flooring. Between two massive shafts the hammer is suspended—a solid block, which driven from above by steam and gathering impetus as it falls, strikes with a force of many hundred tons. A word of warning is given, and those who have no business in the arena are sent hastily to rear, some in an *estrade*, or railed platform, others to the entrance. On that *estrade*, so they tell you, every monarch of Europe has watched such an operation as we are about to see—with mingled feelings one may suspect. It occurs to the visitor that foreign potentates are flattered by a show of drapery, a carpet, or flags, at least, to hide the very plain and simple forms of dirty brick and dirty wood which he surveys; but the attendant assures him that he "don't recollect any difference much." Woolwich is a place of business, and it proudly refuses affectation of elegance. If crowned heads wish to see wonders, it can accommodate them; but if they long for

hanging, and adornments, there is the opera open.

But whilst one reflects, the furnace to be emptied is flaring with impatience. Through the interstices of its great door flames, blue and red and purple, are leaping out and flickering like tossed feathers. All is ready. A huge crane, which overtops even its black colleague the hammer, swings round a pair of enormous pincers, at the end of which a dozen giants cluster. The door rises a little way, and the white light blinds us; at twenty yards away the heat burns our faces uncomfortably. Even those salamanders in the arena prod rather helplessly at first with their pincers, which have been pushed to the very mouth. One of them, shielding his face, throws water into the gap, and in a moment or two they perceive their prey; the huge arms part and firmly close. Then the door rises to its fullest, and in the blinding glow we fancy we can dimly trace a form upright and gigantic. A clash of the crane gear, a shout from the men, and out it comes, easily and softly, one of those monstrous coils already noticed for the 35-ton gun.

Without labour or hesitation the crane swings it about and gently places it on end upon the anvil. Then the hammer falls,

shaking the solid floor beneath us, crushing the red-hot mass inches at a blow, welding its coils together so that they can never part. But the inside hollow must plainly be knocked out of shape in this process, and when the tube has been reduced to its proper length a solid mandril, is deftly slipped betwixt the hammer and the iron. For two or three blows the contracted coil attempts resistance; but it gives way, and the mandril slips to its base, as into butter. Then the great pincers are used again, and easily, smoothly, drops the mass upon its side, where again it is battered and shrunk all round. The irregularities caused by all this hammering are afterwards removed by the plane, as has been described.

It is impossible to say how many guns the foundry could turn out, at a pinch, in any given time. At present it is forging about five thousand tons a year, and the new cannon, be it remarked, do not decay, either with use or time, as did the old. The invention of the system at work must be placed to the credit of Sir William Armstrong, but his process was heavily weighted by the expense. To Mr. R. Fraser, of the Arsenal, we owe the economies of cost and labour which enable us to use the Armstrong system without extravagance.

ELEVATED RAILWAYS.



IN New York and some other American cities elevated railways have been constructed. These are narrow railways, supported on pillars placed at the edge of the pathway. They run along the principal streets, over the vehicles and pedestrians below, relieving them of a great deal of their traffic. The lines are, of course, of very narrow gauge; and the cars are

worked by steam. A single pillar, with cross girders on the top, supports both rails, the vehicles being well balanced. Seated in the luxuriously appointed carriages, the traveller can at his ease see as much of the interior life of the inhabitants as is visible through the first-floor windows.

Of a more romantic character is the elevated railway across the Isthmus of Panama, shown in our title-page. The only steam used on this remarkable line is supplied by the brawny arms of the half-naked Indians, who, turning a handle, work the machine like a rude velocipede.

The position in which the passengers are placed, if scarcely so comfortable as a seat in a Pullman car, affords at least a capital opportunity of studying the peculiarities of tropical scenery, of hearing the morning call of the whistling grasshopper, the screeching of green paroquets, and all the minstrelsy of the woods, with, it may be, the hideous howl of an occasional baboon. Let us hope that the trio repre-

sented in our engraving, and notably the American sea-captain in the middle, who is descanting with so much vigour upon botanical curiosities around him, will come to no grief before the end of their journey. A collision on this line and an abrupt descent into the mass of foliage beneath might lead to a closer acquaintance than desirable with spiders, centipedes, and snakes.

THE LIFEBOAT.



IN this sea-girt isle of ours the warmest sympathies of all are constantly excited on behalf of those who suffer from shipwreck; and it is now happily regarded as one of the most important social duties to provide, so far as practicable, for the safety of the seafaring traveller. Yet it is only within the memory of living men that any real and practical attempts were made to establish means for the preservation of life on our coasts.

As early as 1784, a Mr. Lukin, of Long Acre, a coach-builder, designed and built a vessel which may fairly claim the honour of being the first lifeboat. This he called the "Unimmovable Boat;" but though the Prince of Wales, afterwards George IV., assisted him with money and influence, he was not able to place a boat of this kind at any port, with the exception of one at Bamborough, purchased by a benevolent clergyman. No further efforts were made in this direction until 1789, when the terrible wreck of the *Adventure*, at the mouth of the Tyne, forced the matter again upon public attention. The vessel lay stranded on the Herd Sand, at the entrance of the river, in the midst of tremendous breakers, and her crew "dropped off one by one from her rigging," in the presence of thousands

of spectators, not one of whom dared go afloat to the rescue in any of the ordinary boats. Under the strong feelings excited by this disaster, a committee was appointed, at a meeting of the inhabitants, to offer premiums for the best model of a lifeboat, "calculated to brave the dangers of the sea, particularly of broken water." The prize was gained by Mr. Henry Greathead, whose boat performed a useful service, in 1791, by saving the crew of a Sunderland brig, stranded at the entrance of the Tyne. Before the end of 1803, no fewer than thirty-one lifeboats had been built on Mr. Greathead's principle.

Greathead's boats were lamentably deficient in one respect: when upset, it had no power of self-righting, and the consequence was a terrible disaster in 1810, when one was overturned near Tynemouth, with a loss of thirty-four lives. Some of these boats are still in use, one especially at Redcar, which was built in 1802.

In 1822 public interest was powerfully aroused by several terribly fatal wrecks, notably of the armed brig *Racehorse*, off the Isle of Man. Sir William Hillary sent forth a powerful appeal, which was taken up by other benevolent persons; and the result was the formation, two years afterwards, of the Society now known as the National Lifeboat Institution. On his return to the Isle of Man, Sir William, sup-

ported by the lieutenant-governor and other officers of the island, established, in 1826, a District Association, and the first lifeboat was stationed in Douglas Bay, and three others were added in 1827-9. In 1825, when the *City of Glasgow* steamer was stranded in Douglas Bay, Sir William Hillary assisted in saving the lives of sixty-two persons, and in the same year twenty more from merchant vessels. His greatest success was on November 20, 1830, when he saved in the lifeboat twenty-two men, the whole of the crew of the mail-steamer *St. George*, which became a total wreck on St. Mary's Rock. On this occasion he was washed overboard among the wreck, with three other persons, and was saved with great difficulty, having had six of his ribs fractured.

During its first year of existence, the Society received £9,826, and placed twelve lifeboats on the coast, besides which thirty-nine were placed at various points by other individuals and bodies.

The defects of existing lifeboats now began to attract attention, and an improved model being deemed desirable, the Duke of Northumberland offered a prize for the best, which was awarded by competent naval examiners to James Beeching, of Great Yarmouth, in the year 1851. Mr. Beeching constructed a boat on the self-righting principle, which was purchased by the Ramsgate Harbour Commissioners, and which did good service.

The Lifeboat Committee were not, however, altogether satisfied with Mr. Beeching's plan; and Mr. Peake, one of their number, designed a boat which, with many modifications, is the model now in use. The length of this boat was 30 feet, depth of keel 24 feet, breadth of beam 8 feet, and depth $3\frac{1}{2}$ feet. It pulled ten oars, double-banked. It had side air-cases under the seats, and raised air-cases, 4 feet long, in the extremes, up to gunwale height, the tops being covered with a good coating of cork, to prevent their being stove if jumped upon. In order to free the boat of any water she might ship, eight tubes, closed by self-acting

valves, passed through the deck and bottom. With the ballast of an iron keel of 7 cwt., she weighed 46½ cwt. The draught of water was only 15 inches, or 18 with crew on board.

The following may be taken as a fair sample of the services which are continually being rendered to our brave sailors by the ships of this noble institution. We take the record from an admirable "History of the Lifeboat and its work," written by Mr. Lewis, the Secretary. It should be said that this particular case has not been selected as exhibiting special danger or bravery:—

"A few years ago, the assistance of the Walmer lifeboat was summoned by distress signals from the terrible Goodwins. At 3 in the morning the Walmer and Kingsdown boats were launched simultaneously, the former being named the *Centurion*, and the latter the *Sabrina*. The wind was blowing heavy from S.S.W., and it was raining thickly. Says one of the coxswains, 'We proceeded in the direction of the signals, and, after encountering a fearful sea, we discovered a large steamship on shore in the inner part of the Goodwin, known as the Callipers. At 4 a.m. boarded the said vessel, which proved to be the *Sorrento* screw steamship from the Mediterranean, with a cargo of barley, and bound to Lynn. The master asked us to remain and float the vessel, if possible. We put on board the greater part of both lifeboat crews, who threw over the cargo and carried out an anchor, with a view, if possible, of floating her off over the sands at flowing tide; but the wind and sea increasing as the tide flowed, she soon became a total wreck, filling with water, and the heavy, broken waves making a clean breach over her. At 11 a.m., thinking the two lifeboats, the *Centurion* and *Sabrina*, were insufficient to rescue the whole of the steamer's crew, her ensign was hoisted, union down, for more assistance, but none came; and at noon the *Centurion* lifeboat, which was then lying alongside, together with some of the steamer's boats, were swept away, and the lifeboat was

much damaged in her bows by a huge wave breaking bodily over the steamer, and causing some of the ship's boats to come in collision with the *Centurion*, which was immediately swept with the rest of the floating wreckage into the surf and to the back of the sands altogether, leaving the greater part of their crew on board the steamer. The *Sabrina* lifeboat was anchored a short distance to windward, and the coxswain seeing the disaster happening to the *Centurion*, and feeling assured that a heavy loss of life must immediately follow,

and that amongst the sufferers must have been his three sons, who had voluntarily accompanied him in the lifeboat, and were put on board the steamer to try and float her from off the sands, ordered the *Sabrina* to be immediately run alongside, though it should cost his own life and the rest of his boat's crew. This act was so successfully performed, that the steamer's captain and his crew of twenty men, together with the pilot and lifeboat-men, immediately leaped on board the *Sabrina*, which with the whole party of no less than forty-six persons,



CRISTIN'S PATENT COLLAPSING BOAT.

immediately sheered off, set a close-reefed foresail, and steered through the heavy, boiling surf, to the off edge of the Goodwin, where our brethren in the *Centurion* were awaiting us at anchor, and to whom we transferred a necessary portion of the steamer's crew and lifeboat-men from the *Sabrina*, and then immediately proceeded in company across the sands in a very heavy sea round the North Sand Head for Broadstairs, where we arrived in safety at 2.15 p.m."

During the year 1877 the Royal National Lifeboat Institution expended no less than

£37,860 on its 268 lifeboat establishments on the coasts of England, Scotland, and Ireland; in addition to having contributed to the saving of 1,048 persons from various shipwrecks on our coasts, for which services it granted ten silver medals and seventeen votes of thanks on vellum, besides pecuniary rewards to the amount of £4,069.

The number of lives saved, either by the lifeboats of the Society, or by special exertions, for which it has granted rewards since its formation in 1824, is 25,435, for which services, ninety-two gold medals,

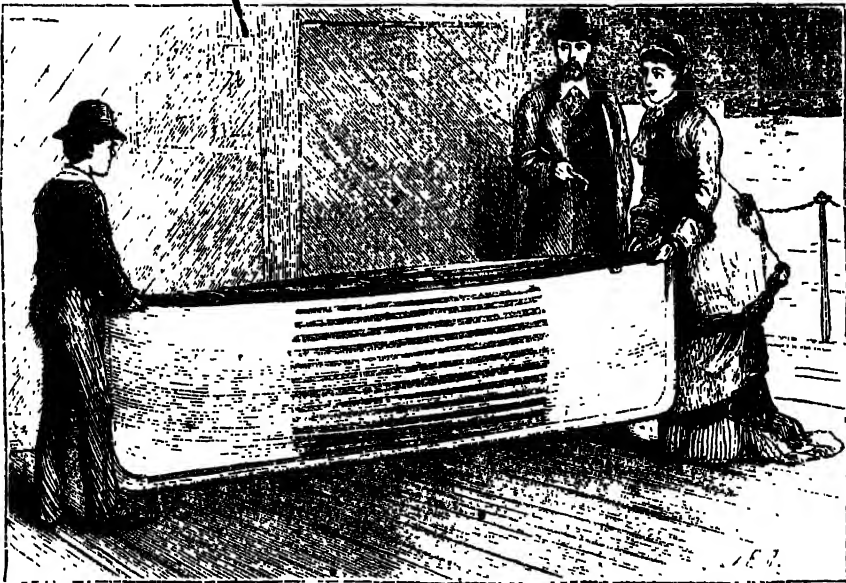
eight hundred and eighty-six silver medals, and £55,000 in cash, have been paid in rewards.

It may be interesting to know that the expense of a lifeboat, its equipment, transporting carriage, and boathouse, averages £900, in addition to £70 a year needed to keep the establishment in a state of efficiency.

Besides lifeboats, many other contrivances for the preservation of life on the water have been designed. Amongst the most remarkable of these is the collapsing

boat, which, though it does not pretend to compete in usefulness with the lifeboat, has yet a distinct value of its own.

One of the chief dangers of ocean travelling is the want of sufficient boat accommodation. Our large steamers now carry their hundreds of passengers, and if any accident should happen, many of these are sure to perish. This absence of boats is not always the fault of the owners. It would be impossible in many cases for a ship to carry boats enough to contain all on board. Hence the value of a boat



CRISPIN'S BOAT CLOSED FOR STOWAGE.

which can be compressed into a small compass, and so occupy little room amongst the thousand-and-one articles which crowd a ship. Such a contrivance would indeed be priceless to passenger vessels, and for troop and emigrant ships, where space must be economized, and yet where more boat accommodation, in case of accident, is absolutely necessary. Various inventions have been patented to accomplish this object. One, by a clergyman, the Rev. Mr. Berthon, is described on another page. Another, of which we give two engravings, is the invention of a Mr. Crispin,

of Stratford. This boat is made entirely of very thin steel, a material which is at once light, tough, and durable. The specimen, represented in our engravings is eleven feet in length by three feet nine inches beam; the ends are of smooth metal, and the body of corrugated steel, and the craft is rendered unsinkable by placing air-bags between the thwarts. When closed for stowage the diameter is only sixteen inches, and it is made to expand while being lowered from the davits. As will be seen from our picture, it is so light that a lady and boy are able to expand and close it.



OSTRICH FARMING.

NEXT to wool and diamonds, ostrich farming is the most important industry of South Africa. Mr. Anthony Trollope's recently published book on "South Africa," contains the following description:—

"I was taken from Grahamstown to see an ostrich farm about fifteen miles distant. The establishment belongs to Mr. Douglas, who is, I believe, among the ostrich farmers of the colony about the most successful; and who was, if not the first, the first who did the work on a large scale. He is, moreover, the patentee for an egg-hatching machine, or incubator, which is now in use among many of the feather-growers of the district. Mr. Douglas occupies about 1200 acres of rough ground, formerly devoted to sheep-farming. The country around was all used not long since as sheep walks, but seems to have so much deteriorated by changes in the grasses as to be no longer profitable for that purpose. But it will feed ostriches.

At this establishment I found about 300 of those birds, which, taking them all round, young and old, were worth about £30 a piece. Each bird fit for plucking gives two crops of feathers a year, and produces on the average feathers to the value of £15 per annum. The creatures feed themselves, unless when sick or young, and live upon the various bushes and grasses of the land. The farm is divided out into paddocks, and, with those which are breeding, one cock with two hens occupies each paddock. The young birds—for they do not breed till they are three years old—or those which are not paired, run in flocks of thirty or forty each. They are subject to diseases which, of course, require attention, and are apt to damage themselves, sometimes breaking their own bones, and getting themselves caught in the wire fences. Otherwise, they are hardy brutes which can stand much heat and cold, can do for long periods without

water, require no delicate feeding, and give, at existing prices, ample returns for the care bestowed upon them.

But, nevertheless, ostrich farming is a precarious venture. The birds are of such value, a full-grown bird in perfect health being worth as much as £75, that there are of course risks of great loss. And I doubt whether the industry has, as yet, existed long enough for those who employ it to know all its conditions. The two great things to do are to hatch the eggs; and then to pluck or cut the feathers, sort them, and send them to the market. I think I may say that ostrich farming without the use of an incubator can never produce great results. The birds injure their feathers by sitting, and at every hatching lose two months. There is, too, great uncertainty as to the number of young birds which will be produced, and much danger as to the fate of the young bird when hatched. An incubator seems to be a necessity for ostrich farming. Surely, no less appropriate word was ever introduced into the language, for it is a machine expressly invented to render unnecessary the process of incubation. The farmer who devotes himself to artificial hatching provides himself with an assortment of dummy eggs, consisting of egg-shells blown and filled with sand, and with these successfully allures the hens to lay. The animals are so large, and the ground is so open, that there is but little difficulty in watching them and in obtaining the eggs. As each egg is worth nearly £5, I should think that they would be open to much theft when the operation becomes more general; but as yet there has not come up a market for the receipt of stolen goods. When found, they are brought to the head-quarters, and kept till the vacancy occurs for them in the machine.

The incubator is a low, ugly piece of deal furniture, standing on four legs, perhaps eight or nine feet long. At each end there

are two drawers, in which the eggs are laid with a certain apparatus of flannel; and these drawers, by means of screws beneath them, are raised and lowered to the extent of two or three inches. The drawer is lowered when it is pulled out, and is capable of receiving a certain number of eggs; I saw, I think, fifteen in one. Over the drawers and along the top of the whole machine there is a tank filled with hot water, and the drawer, when closed, is screwed up so as to bring the side of the egg in contact with the bottom of the tank. Hence comes the necessary warmth. Below the machine and in the centre of it a lamp or lamps are placed which maintain the heat that is required. The eggs lie in the drawer for six weeks, and then the bird is brought out.

All this is simple enough, and yet the work of hatching is most complicated, and requires not only care, but a capacity of tracing results which is not given to all men. The ostrich turns her egg frequently, so that each side of it may receive due attention. The ostrich farmer must therefore turn his eggs. This he does about three times a day. A certain amount of moisture is required, as in nature moisture exudes from the sitting bird. The heat must be moderated according to circumstances, or the yolk becomes glue, and the young bird is choked. Nature has to be followed most minutely, and must be observed and understood before it can be followed. And when the time for birth comes on, the ostrich farmer must turn midwife and delicately assist the young one to open its shell, having certain instruments for the purpose. And when he has performed his obstetrical operations, he must become a nursing mother to the young progeny, who can by no means walk about and get his living in his earliest days. The little chickens in our farmyards seem to take the world very easily; but they have their mother's wings, and we as yet hardly know all the assistance which is thus given to them. But the ostrich farmer must know enough to keep his young ones alive, or he will soon be ruined; for each bird when hatched is supposed to be worth

£10. The ostrich farmer must take upon himself all the functions of the ostrich mother, and must know all that instinct has taught her, or he will hardly be successful.

The birds are plucked before they are a year old, and I think that no one as yet knows the limit of age to which they will live and be plucked. I saw birds which had been plucked for sixteen years, and were still in high feather. When the plucking time has come, the necessary number of birds are enticed by a liberal display of mealies—as maize or Indian corn is called in South Africa—into a pen, one side of which is movable. The birds will go willingly after mealies, and will run about their paddocks after any one they see, in the expectation of these delicacies. When the pen is full, the movable side is run in, so that the birds are compressed together beyond the power of violent struggling. They cannot spread their wings, or make the dart forward which is customary to them when about to kick. Then men go in among them, and, taking up their wings, pluck or cut their feathers. Both processes are common, but the former I think is most so, as being the more profitable. There is a heavier weight to sell when the feather is plucked; and the quill begins to grow again at once, whereas the process is delayed when nature is called upon to eject the stump. I did not see the thing done, but I was assured that the little notice taken by the animal of the operation may be accepted as proof that the pain, if any, is slight. I leave this question to the decision of naturalists and anti-vivisectionists.

The feathers are then sorted into various lots; the white primary outside rim from under the bird's wing being by far the most valuable—being sold, as I have said before, at a price as high as £25 a pound. The sorting does not seem to be a difficult operation, and is done by coloured men. The produce is then packed in boxes, and sent down to be sold at Port Elizabeth by auction.

As far as I saw, all labour about the place, was done by black men, except that which fell to the lot of the owner and two or three

young men who were with him, and were learn-
in the work under his care. These were men
who lived each in his own hut with his wife
and family. They receive 26s. a month
and their diet, which consists of two pounds of
meat and two pounds of mealies a day. The
man himself could not eat this amount of
food, but would no doubt find it little enough
with his wife and children. With this, he
has permission to build his hut about the
place, and to burn his master's fuel. He
buys coffee, if he wants it, from his master's
store,—and in his present condition gene-
rally does want it. When in his hut he rolls
himself in his blanket; but when he comes
out to his work, attires himself in some more
or less European attire, according to regula-
tion." (The men whom Mr. Trollope saw
working here were not Kaffirs, but Indian
coolies.)

The Kaffir is a good-humoured fellow,
but if occasion should arise he would prob-
ably be a rebel. On this very spot where I
was talking to him, the master of the farm
had felt himself compelled during the last
year, 1876, to add a couple of towers to his
house; so that in the event of an attack he
might be able to withdraw his family from

the reach of shot, and have a guarded plat-
form from whence to fire at his enemies.
Whether or not the danger was near, as he
thought it last year, I am unable to say;
but there was the fact that he had found it
necessary so to protect himself, only a few
months since, within twenty miles of Gra-
hamstown! Such absence of the feeling of
security must of course be injurious, if not
destructive to all industrial operations.

I may add with regard to ostrich farming,
that I have heard that 50 per cent. per annum
on the capital invested has been not uncom-
monly made. But I have heard also that
all the capital invested has not unfrequently
been lost. It must be regarded as a
precarious business, and one which requires
special adaptation in the person who
conducts it. And to this must be added
the fact that it depends entirely on a freak
of fashion. Wheat and wool, cotton and
coffee, leather and planks, men will certainly
continue to want: and of these things the
value will undoubtedly be maintained by
competition for their possession.

But ostrich feathers may become a drug:
when the nursemaid affects them, the duchess
will cease to do so."

ELEVEN MONTHS IN A YACHT.



MR. BRASSEY'S delightful
"Cruise in the *Sunbeam*,"
is the very romance of ad-
venturous yachting; it is the
voyages of the rough old cir-
cumnavigators translated into
the picturesquely luxurious.
How well we remember
(says a writer in the *Times*),
those great quartos of coarse
grey paper in which we used
to pore over the discoveries of

Wallis and Cook, though the narrative was
apt to become tediously monotonous in the
baffling calms and the shifting currents;
where we read of "making short boards" on

the long ground swell that broke in crested
breakers on the coral reefs; of the salt junk
and the weevily biscuit; of scurvy and short
allowance of water, in ships whose canvas
was getting shockingly out-at-elbows, and
which came home in a sheathing of barna-
cles and seaweed. Here, on the other hand,
we admire in the frontispiece the graceful
lines and spars of the *Sunbeam*, as she
cleaves the seas under a press of sail, with
auxiliary steam-power in case of necessity.
Mr. Brassey sailed when he could; he even
beat up the Red Sea, in withering heat, in
the face of fitful breezes blowing off the
deserts. But when patience was being
tried beyond endurance, he could always

light up his fires; otherwise the voyage that led them through straits and inland seas might have rivalled in length the peregrinations of Ulysses. As it was, they passed eleven months in their "home on the ocean."

If Mr. Brassey had superintended the architecture of the yacht, his wife had presided over the arrangements and decorations. "A cosy corner," with the marqueterie and ormolu, the cushions, the old china, and the flowers, is a bit out of the brightest of London boudoirs. When they sailed from Cowes, they shipped roses sufficient to carry them comfortably on to the relay in the blooming gardens of Funchal, so that the cabins were swept out with rose instead of tea leaves. The graceful vessel, designed by practical experience, was a rare combination of speed and comfort. Whenever they came to an anchor, they were boarded by the troops of friends that they made everywhere, and they repaid the hospitalities that welcomed them on shore to guests who came on board by promiscuous invitation. From the head-quarters of their floating hotel they made exciting expeditions, while Mrs. Brassey, with her children and the passengers, would cut off corners from port to port, travelling under the most intelligent guidance available. Wherever they went, whether at the Government-house in the colonies, at the residences of the English consuls, or of rich and hospitable foreigners, they seem to have been invariably entertained with equal cordiality. They saw wild horses lassoed and broken by the *gnachos*; they climbed to the glowing craters of volcanoes; they made pilgrimages to the most commanding points of view; they went botanizing and butterfly-hunting in tropical forests; they got up picnic parties in the cocoa-nut groves of the South Seas, where the dessert was gathered from the tree overhead; they went shopping everywhere in the bazaars and markets, to come back laden with curiosities living and dead; they even did a passing stroke of trade with naked Patagonians, who put off in canoes in the Straits of Magellan; until

the *Sunbeam* must have been turned into a floating international exhibition, with collections of natural history caged on her deck.

But although they had a time of enjoyable intellectual excitement, it was not all smooth sailing by any means. Mr. Brassey, as we said, sailed his own yacht, and, although the sense of responsibility may have been pleasurable in the main, it must often have made him anxious enough. It was no joke navigating the labyrinths of intricate reefs and sandbanks, in land-locked estuaries, among treacherous currents; nor steering across the lonely expanse of the Pacific, or along the rugged shores of Southern America, where the charts were sometimes proved to be inaccurate, with an occasional mistake about a non-existent lighthouse. Night after night the master had to pass upon the bridge, for his officers were not invariably to be relied upon, and he seldom shipped a pilot when he could help it.

The successful accomplishment of the voyage was a skilful and daring piece of seamanship, nor need we have any great fear of our naval supremacy so long as we can produce yachtsmen like Mr. Brassey.

And more than once they were exposed to imminent dangers that no seamanship could foresee. They were caught in a squall in mid-ocean, between the Sandwich Isles and Yokohama, that carried away their jibboom and foretopmast, hampering the ship awkwardly with the fallen lumber. They had two alarms of fire. Once it broke out under the flooring of the nursery, and then they owed their safety to their admirable appliances for extinguishing it. There is a capital picture in the book, of a couple of the children being hurried upstairs by the doctor, with a pair of sturdy little legs dangling under each arm. And more than once in the South Seas and Patagonia they had to indulge their curiosity in landing with an armed escort where the natives were unmistakeably hostile, or were better known than trusted. There was variety enough in the voyage, and Mrs. Brassey has made the very most of it. The great charm of her style is in its being

so perfectly easy and unstudied ; she faithfully reflects the shifting impressions that struck a lively and versatile mind. She tells you just what you care to hear, changing the subject before it has begun to bore you ; she has quick artistic perceptions, with a subdued sense of humour ; and there is a freshness even in the descriptions of the scenery that has been made familiar to us in the writings of innumerable travellers. Above all, she appears to be blessed with excellent health and unflagging spirits, although one would be more astonished at her powers of endurance did we not remember those long intervals of enforced repose which gave time for recruiting against the next excitement.

Each successive stage in the voyage brought its own responsibilities of sight-seeing. When you are due in England nearly at a certain day, there is little time to be lost, even though you may have eleven months to come and go upon. The relaxations at Madeira, after the first long sea run, were agreeable and leisurely enough ; and it must have been delightful to set foot again upon firm ground, under those sunny skies and in those fragrant gardens, after the stormy voyage down the Channel and the tossing on the billows of the Atlantic. Mrs. Brassey, by-the-by, is by no means the best of sailors, so that there were a good many crumpled rose-leaves even in that "cosy corner" of the cabin.

If you go shopping on a pleasure cruise round the world, and wish to carry away satisfactory specimens of the most choice of the local specialities, you ought to be provided with the purse of Fortunatus. Whether it is jade in China, or lacquer-work in Japan, hats in Panama, or ponchos on the River Plate, the masterpieces of tropical manufacture are all extraordinarily expensive ; but then, on the other hand, even the more perishable materials seem to last practically for ever. At Rio de Janeiro Mrs. Brassey paid the first of her visits to the artificial-flower shops, where the colours are borrowed from the undyed feathers of the gorgeous birds, each separate petal

consisting of the throat or breast of the humming-bird, while the leaves are the glossy wings of the beetles. "The prices asked astonished us greatly ; the cost of five sprays which I had been commissioned to buy was £29, and the price of all the others was proportionately high. But then they wear for ever." *En revanche*, some of the other markets were more interesting, and their contents cheaper and more curious. The fish-stalls exhibited the quaintest and most grotesque monsters, from a rockfish of 300lb. weight downwards, including singularly hideous specimens of the *pieuvre*, while there were prawns even bigger than the land centipedes and millipedes, eight inches or ten inches in length, and with antennæ measuring fourteen inches. The fruits were as varied as the fish ; while in another part of the market there was a display of live animals.

At Buenos Ayres they had opportunities of adding to their zoological knowledge in a visit they paid to the agricultural show. The horses and cattle were small, and the fine fleeces of the merino sheep were thickly plastered with mud ; but there were vicuñas, llamas, bizcachos, and various species of deer. It was there that they made investments in the costly ponchos, one of which was subsequently stolen. Like the Spanish *capa*, "everybody wears one, from the beggar to the highest official. The genuine article is very difficult to get, even here. In the shops the price usually varies from £30 to £80. They are soft as silk, perfectly waterproof, and will wear, it is said, for ever."

Next, to change the scene from cities to the pampas, we have a touching account of an incident that was witnessed in a ride through one of the villages of the bizcachos, where those prairie dogs live in the happiest relations with the owls and the rattle-snakes :— "As we were riding along, the dogs found and killed a bizcacho in a bank. Just as Mr. Elliot had pulled it out, and laid it dead in the field, its little companion owl arrived, and appeared to be in a most dreadful state of mind. It shrieked and cried as

it hovered over us, and finally selected a small white fox terrier, who I think really had been principally concerned in the death, as the object of its vengeance, pouncing down upon his head, and giving him two or three good pecks, at the same time flapping its wings violently. The other dogs drove it off, but more than half an hour afterwards, while we were looking at some horses, nearly a mile from the spot, the plucky little owl returned to the charge, and again swooped down upon the dog with a dismal cry and administered a vigorous peck to him."

It was on the voyage from the River Plate to the Straits of Magellan that the *Sunbeam* rescued the crew of the *Monkshaven*. In the after-swell of what had evidently been a tremendous gale, they had made out a water-logged steamer, which was signalling "ship on fire." There was no appearance of either flame or smoke, but on boarding her she proved to be the *Monkshaven*, of Whitby, bound for Valparaiso, with smelting coal, which had caught fire, and was smouldering below hatches. The crew were living on deck under canvas, and when the hatches were opened for a moment, there came forth a volume of suffocating smoke. Nothing could be done for the ship, but the men were taken on board the *Sunbeam*; and, although, of course, Mr. Brassey never hesitated as to playing the Good Samaritan, his charity involved him in discomforts and might have entailed serious consequences. For the united ships' companies, owners and passengers included, had to be put on half allowance of food and water. Happily they came across one of the Pacific Company's steamers, and were able to transship the grateful castaways. It seems that the smelting coal is so dangerous a cargo that there is a conflagration in one voyage out of three, although, of course, in most cases the fire is got under.

Nothing on the voyage was more creditable to Mr. Brassey than the way in which he navigated the *Sunbeam* through the Straits of Magellan. "Although perhaps I ought not to say so, I cannot help admiring the

manner in which Tom has piloted his yacht through the Straits, for it would do credit, not only to any amateur, but to a professional seaman. He has never hesitated nor been at a loss for a moment, however intricate the part or complicated the directions; but having thoroughly studied and mastered the subject beforehand, he has been able to go steadily the whole way at full speed. It has, however, been very fatiguing work for him, as he hardly ever left the bridge the whole way."

Nor could anything well have been more magnificent than the savage Antarctic scenery:—"The stupendous glaciers run right down into the sea, and immense masses of ice, sometimes larger than a ship, were continually breaking off with a noise like thunder and falling into the water, sending huge waves across to the opposite shore, and sometimes completely blocking up the channels. Some of these glaciers, composed entirely of blue and green ice, and the purest snow, are 15 or 20 miles in length. They are by far the finest we have any of us ever seen, and even those of Norway and Switzerland sink into comparative insignificance beside them."

Take this as a companion picture of the softer submarine beauties of the South Seas. It was off the island of Hao Harpe:—"It is really impossible to describe the beauty of the scene before us—submarine coral forests of every colour, studded with sea flowers, anemones, and echinidæ of a brilliancy only to be seen in dreamland; shoals of the brightest and swiftest fish, darting and flashing in and out; shells, every one of which was fit to hold the place of honour in a conchologist's collection, moving slowly along with their living inmates. This is what we saw when we looked down from the side of the boat into the depths below. The surface of the water glittered with every imaginable tint, from the palest aquamarine to the brightest emerald, from the pure blue light of the turquoise to the deep dark blue of the sapphire, and was dotted here and there with patches of red, brown, and green coral rising from the mass below."

We should be glad to quote the descriptions of fires by night and day in the vast crater of the famous volcano of Kilauea, in Hawaii (of which we give Miss Bird's account on another page). When Mrs. Brassey says, "Once I slipped, and my foot sank through the thin crust; sparks issued from the ground, and the stick on which I leant caught fire before I could fairly recover myself," she gives an idea of the violence of the volcanic agencies. Twice, as she tells us, she fainted on her return to the hotel, not to speak of repeatedly collapsing; so that we are not surprised to hear that she had on this occasion to submit to finish the trying expedition in a chair.

They had a narrow escape, too, from being victims of a tragedy. Keeping Christmas next day at the "Volcano House," she was admiring the grandeur of the spectacle from the windows, when the pillar of fire she was watching suddenly dimmed and disappeared. "At the same moment a river of glowing lava issued from the side of the bank we had climbed with so much difficulty yesterday, and slowly, but surely, overflowed the ground we had walked over."

One of the most sensational of the various spectacles they witnessed in Polynesia was at Hilo, in the same island of Hawaii. They had been marvelling at the feats of the swimmers in the surf, but these proved comparatively tame when contrasted with

what succeeded. We have heard of the jumping feats of the Persians, but nothing except Sam Patch's exploits at Niagara can come up to the very remarkable performances which these Hawaiians seemed to take as a matter of course, and to us, at least, they are new. Two men took a run and made a spring off the precipice, 100 feet in height, clearing a projecting cliff 20 feet below, turning a somersault in mid-air, alighting in the water of the pool at the bottom, and emerging on the opposite bank as if nothing particular had happened.

We wish we could linger with Mrs. Brassey in that enchanted Paradise of the Sandwich Isles, where the only traces of the primæval curse seem to be the intense heat and the abominable insects; or that we had the leisure to accompany her on her homeward voyage by Japan and China, through the Straits of Malacca to Ceylon, and thence up the Red Sea to the Suez Canal. The latter stages of this journey, remote as some of them are, are more within the beaten routes of tourists, and merchants, and officers on service. But the whole of the book is nearly equally delightful. You have but to dip in it at random, and you are sure to find something entertaining; and we are only inclined to regret that in the course of her circumnavigation Mrs. Brassey should have skimmed the cream of the world.





RAWLINSON MOUNTAIN, ON LAKE TANGANYIKA.

From a sketch by Lieut. Cameron.

THREE THOUSAND MILES ON FOOT.

CAMERON'S WALK ACROSS AFRICA.



HIS intrepid young hero, who went out to Africa in connection with the Livingstone Search Expedition, and whose subsequent successes as an African explorer and discoverer have conferred such honour on himself and on his country, is the son of a clergyman in Kent. He entered the Royal Navy in early life, and possibly might have passed a very uneventful career had he not conceived the idea of offering his services to go to

Africa in search of Dr. Livingstone. Lord Palmerston once said that "whenever he wanted anything done, and done well, he put the business into the hands of a naval officer. They were men," said he, "who would go anywhere and do anything;" and most certainly this is true as regards Lieutenant Cameron.

Cameron proceeded, in the first instance, to Africa on behalf of the Livingstone Search and Relief Expedition. After Dr. Livingstone's death he undertook an exploration on his own account, under the auspices of the Royal Geographical Society, and his first important discovery was that

of an outlet from Lake Tanganyika flowing apparently to the great Lualaba of Livingstone. He left Ujiji in March, 1874, with the view of tracing down the outlet from Tanganyika to Lualaba, pursuing its course, supposing it to be the Congo, as far as the western coast of Africa. The journey on which he then entered with little preparation, except an ardent desire to explore Africa, was one of extreme danger. Should he, indeed, succeed—single-handed as he was—in crossing the African continent through a country unknown, and beset by wild and hostile tribes, he would have accomplished a feat unparalleled in the annals of geographical discovery, and take his place in the first rank of African explorers. In carrying out this programme he fairly crossed the continent of Africa, travelling on foot upwards of 2950 miles, from Zanzibar to Benguela, trusting to mere accident as he went along. In making that transit he traversed 1200 miles of entirely new country. He was, further, able to make a series of most extensive and elaborate observations. He has laid down, for the first time, a sound geographical basis for further observations.

At a special meeting of the Royal Geographical Society, presided over by the Duke of Edinburgh, Lieutenant Cameron gave the following *résumé* of his journey: "The first portion of the journey may be considered as that from the east coast to Ujiji. The expedition consisted originally of Dr. Dillon and myself; at Aden, Mr. Murphy, of the Royal Artillery, volunteered, and joined us afterwards at Zanzibar, and a day or two before leaving Bagamoyo, Mr. Moffat, of Natal, a nephew of Dr. Livingstone, also joined. My first great difficulty was to provide porters to carry our stores; and after nearly a month at Bagamoyo I formed a camp at Shamba Gonera to try and keep the men together, but with no good results.

In the middle of March, 1873, Dillon started to form a camp at Kikoka, the farthest Balooch outpost of Seyyid Burghash, and a little beyond the Kingani.

A few days afterwards Sir Bartle Frère came over to Bagamoyo, bringing Moffat with him. Two days afterwards I joined Dillon at Kikoka, leaving Murphy ill with fever under charge of the French missionaries at Bagamoyo. The French missionaries were most kind and hospitable during our stay, and they are doing a very good and important work in the country. They have a large number of pupils, who, besides being Christianized and taught to read and write, are also instructed in the ways and means of earning their livelihood in after-life. There was a great deal of opposition amongst the Waymerima, owing to an idea (which pursued us to Unyanyembé) that we were personally engaged in putting down the slave-trade, though the higher class Arabs were friendly to us. Moffat accompanied me to Kikoka, and then returned to Bagamoyo to assist Murphy.

On March 28th, 1873, Dillon and I started from Kikoka, but had to leave many loads behind, owing to the porters having got back into Bagamoyo, notwithstanding my having paid the guard at the Kingani to prevent their crossing. From Kikoka, Dillon and I marched to Msuwah, across an almost uninhabited country, with park-like stretches of open grass, clumps of fine trees, and strips of jungle, and here and there intersected by nullahs, which, after heavy showers of rain, became considerable streams. We were detained in one place some days trying to get food, which was very scarce, and the villages lay some way from the road. I went out once to look for it, but, owing to trusting to Bombay, lost the track, and had to sleep in a swamp, amid pouring rain; in consequence of which I was laid up with fever until our arrival at Msuwah. At Msuwah the country began to rise more decidedly than it had hitherto done. There was a good deal of cultivation about, but the villages were in dense clumps of jungle, and very few strangers are allowed to enter them. We formed our camp close to the village of the chief, and were initiated into paying tribute, having to give 30 dotis to a smiling old villain.

From M̄suwah we travelled on with an Arab caravan till past Simbaw̄eni, crossing the Lugereugeri on our third march, and going through a pass in the Duthumi hills, and then through a well-cultivated fertile valley full of small conical knolls, and by another pass on to Simbaw̄eni, and then across the Lugereugeri a second time. From here we followed the same route as Stanley to Reheneko, on the other side of the Makata. At Reheneko, Dillon and I halted for a month, to wait for Moffat and Murphy, at the end of which time Murphy came up alone, bringing the sad news that Moffat had died before crossing the Makata. Poor young fellow! his whole heart was in the expedition. He had sold his all—a sugar plantation at Natal—and was willing to expend the last farthing in the cause of African exploration. Murphy himself was very ill when he arrived. After a few days' halt, to enable him to recover his strength somewhat, we started across the Usagara mountains, and then passed Miunyi Useghara, up the valley of the Mukoudokwa, by the same route as Stanley to Lake Ugombo, and then across a rough, waterless country to Mpwapwa. At Mpwapwa were three or four caravans of different sizes, and one of Wanyamwezi would have been robbed if I had not interfered to prevent it. From Mpwapwa we went on across the Marenga Mkali, and to obviate the inconvenience of being without water for two days, I filled four air-pillows with water which held three gallons each. After the Marenga Mkali we arrived at Moum̄é, the first station in Ugogo, and came into the full swing of tribute-paying, and were detained three or four days before it could be settled. The first day, the chief and all hands were drunk, and the next day the chief would only receive the tribute through his prime minister, and he was too drunk to transact any business; and so on from day to day.

There is no passing through Ugogo without paying tribute; for, although the people do not as a rule fight, if the demand is resisted they carry off all they can of their provisions and stores, destroy their houses

and all they leave behind, fill up their waterholes, and retreat into the jungles, and leave the strangers to die of thirst and starvation, assured of being repaid by the stores, which are certain to be abandoned, for any losses they themselves have incurred. This occurred two or three times when Arab caravans have attempted to avoid paying mhongo. Soon after Moum̄é we struck Burton's route at Kanyenyé, or Great Ugogo, where the same chief (Mogamba) reigns as was there in his time. From Kanyenyé we went on rising, at the end of the plain which leads up a steep wall-like range of hills to another plateau. On this plateau we went through a range of hills formed of blocks and boulders of granite piled about in the wildest confusion, and came to Usekhé, where we camped close to the largest boulder of granite that, up to that time, I had ever seen.

Here again tribute, drunkenness, and delays, and then on our march to Khoko, where some Wamerima are settled, and where we camped under one of three enormous trees—our own caravan, and others accompanying it, in all amounting to about five hundred men, camping under one tree.

From here was one march to Mdabaree, the last district of Ugogo, and where we finished with mhongo for the time being. As we were a short way from where white men had passed before, the chief's headman said we had to stop till all the people had seen us; in fact, he made a raree show of us.

We now entered on what used to be dreaded as Mgunda Mkali, or fiery field, but which now is far easier to traverse than it was in the days of Burton and Speke. After a few days we came to Jiwé la Singa, where there are almost as many fantastic boulders as near Usekhé, the name of the place meaning the rock of soft grass. From here we marched through a wild and uninhabited country, with much game, but very wild and scared, making longish marches on account of the scarcity and badness of the water.

On July 31 we reached the village of the chief of Urgu. Here we stopped

one day to buy food, as our provisions were exhausted, and for the first time camped in a village. Our tents were crowded all day long, and at night we found that they had left many small but disagreeable inhabitants behind them.

From here to the outlying villages of Unyanyembe was four long marches through uninhabited country. At the end of the second we camped at a place called Marwa, where water is only to be obtained by digging at the base of a boulder, and no one is allowed to say maji—the common word for water—to fire a gun, or walk by with sandals or boots, for fear of offending the fiend in charge of the spring, and causing him to stop the supply of water.

The next morning, as Dillon and I were out on one side of the track looking for game, we saw a couple of lions about 600 or 700 yards off trotting quietly home after a night out. The same afternoon we heard an alarm of 'Ruga, ruga!' or robbers, and going to the front found that a small party had been robbed of some ivory and two women slaves, and had had a man wounded. Our men were in a great funk, but we managed to get them along, and about five p.m. we arrived at a large pond, camped, and fenced ourselves in. In the early part of the night a few arrows were shot into the camp; but we kept watch ourselves, and made our men do likewise, and so the rest of the night passed without further alarms.

The next day we arrived at the outlying villages of Unyanyembe, and on Aug. 5th we marched into Kwikuruh, its capital, and were entertained at breakfast by Said ibn Salim ibn Raschid el Lamki, the Arab governor, and thoroughly did we enjoy our good breakfast after the scanty fare on which we had been living. After breakfast, he and many other Arabs escorted us to the house where Stanley had lived, and which was now lent to us by Said ibn Salim. After a couple of days we had to pay a round of visits to all the principal Arabs, and eat with all. This was a very formidable undertaking, as we had to eat something with each to avoid giving offence, and

this lasted from ten a.m. till four p.m. A day or two afterwards I was knocked over by fever, and Dillon and Murphy soon followed suit.

About the 21st of August a letter from Sir Samuel Baker arrived in charge of some of King Mtesa's men, and I sent a letter back by them. We were delayed by fever, blindness, and other illnesses till the end of October—and also by desertion of men—when Chumah and another man arrived, bringing the news of Dr. Livingstone's death, and saying that his caravan was near. I instantly sent off a large bale of cloth to assist them. When the body of Dr. Livingstone arrived, all the principal Arabs assembled at our house to show respect to his memory. A few days after Murphy resigned; and when I was on the point of starting westward, having fitted out Livingstone's men with stores for the coast, Dillon was so ill as to be unable to proceed. After he had decided to return, Murphy volunteered to rejoin the expedition, but, owing to difficulties about stores and porters, I thought it best to go on alone. Dillon and Murphy, with Dr. Livingstone's corpse, left for the coast on the 9th of November, 1873, and the same day I started for Ujiji. I tried to steer straight for Ujiji, but, owing to the fear all my men were in of the ubiquitous Mirambo, and the desertions caused by it, I had to make a considerable *détour* to the south. A few days after I parted from my two companions I received the sad news of Dillon's death. I reached Uganda in the beginning of December, and there found Murphy, who had lost some of his cloth, and had had to send back to the Arab governor for more. After one day at the capital of Uganda I went on west, but two marches out was met by a chief, who said we could not pass that road until he had settled some row with the Arabs at Unyanyembe. This delayed us till the beginning of January.

On January 5th we reached the boundaries of Unyamwezi proper, and then across a large plain and the S'Ngombé, and came to Ugara, in all three districts of

which I had to pay tribute. After Ugaga I came to a mountainous country—Kawendi—and running water, the first which I had seen since leaving Mpwapwa. The mountains extend to the borders of the Tanganyika; but at Ugaga we came on Burton's route, and thence, passing just to the north of the Malagarazi valley, we arrived at the Tanganyika by a comparatively easy route. Before reaching Ugaga, however, we had a good deal of trouble, as the guides did not know the road. I was utterly lame from a large abscess on my leg, and therefore unable to take the head of the caravan and direct its course.

On my first view of the Tanganyika I could scarcely comprehend it. Such was the immensity of the view that I fancied the grey lake to be sky, and the mountains of Ugoma in the distance to be clouds. However, it dawned on me by degrees that that was the lake and nothing else. At Kawélé, the capital of Ujiji, I was well received by the Arabs, and after securing the books and other things left here by Dr. Livingstone, I immediately made preparations, and got away for a cruise round the lake. In my cruise I found 96 rivers, besides torrents and springs coming into the lake in the portion I went round, and one—the Lukuga—going out. This river flows to the Lurwa, and joins it at a short distance below lake Moero. As soon as I could get a few stores I returned to Kasengé, the place where Speke landed on the western bank of the Tanganyika.

After leaving Kasengé, we first crossed the southern end of the mountains of Ugoma (although nominally in Uguhha), and many streams flowing south and south-west towards the Lukuga. The first country we passed was Uguhha. The people there are distinguished by the peculiar and tasteful manner in which they dress their hair, and the elaborate tattooing on the women's stomachs. Their clothing then appeared to me remarkably scanty, but, compared with what I saw farther on, was very ample.

From Uguhha we crossed the mountains

of Bambarre, and on arriving at their foot came into a completely new style of country. The huts were all built in long, low streets, and rows of oil-palms were planted down the centre. The women did up their hair in the most extraordinary manner. Many of their head-dresses looked like an old-fashioned bonnet with the back out, and long ringlets hanging down their necks. The men plastered their hair with clay into cones and patches, so that they looked as if they had some sort of helmet on their heads. Between the patches of clay their heads were shaved, leaving the scalp bare.

After having been detained at Nyangwé about three weeks, a party of Arabs came in from the south side of the river, where they had been fighting with the natives, bringing news that Tipó-Tipó was coming. Tipó-Tipó on his arrival told me that if I would come down with him to his camp, some eight marches south of Nyangwé, I should from there be able to find my way to a great lake into which the Lualaba fell. When I reached his camp I found that the chief on the opposite side of the Lomami refused to let me pass, saying that no caravan had ever been through his country, and if anybody tried to pass he would fight them. When at Tipó-Tipó's camp I heard of a lake called Iki, which I believe is the lake Chebungo, or Lincoln, of Livingstone, which is a little to the west of the Lomami and on the Lawembi.

Leaving Tipó-Tipó's, we went nearly south, going close along the right bank of the Lomami. At many places the people were very friendly, but in others so many reports had come that no caravans came near there for any other purpose than getting slaves, that the villages were deserted, and we were often in difficulties about food. As we were passing through a strip of jungle, some people commenced shooting at us, and an arrow glanced off my leather coat. I ran this man down, and gave him a thrashing, but would not allow any one to fire in return, and walked straight up to some people who were in front of us. We tried to make a palaver, in



LIEUTENANT CAMERON'S RECEPTION BY KATENDE.

which, after a time, we were successful, and we went on with the natives as the best of friends. In the afternoon women and children were about our camp selling food, and everybody seemed most friendly. Next morning, as we were packing up for the road, I missed my pet goat Dinah, and, asking where she was, I was told that she slept outside the camp. I went to look for her, and walked up into the village to ask about her, and so little did I suspect any harm that I had no gun or pistol with me, and the man who accompanied me was also entirely unarmed. When we made inquiries about the goat, the natives began shooting at us. Some of my men ran up and brought me my rifle and pistol, and the remainder packed up all our stores and came into the village. For a long time I would not allow my people to fire. At last, as the natives were closing in, and a large body of from 400 to 500 men came up from the road which we had intended to go, I allowed two or three shots to be fired, and I believe one of the natives was then shot through the leg. After this we commenced a parley, and it was proposed that my goat should be returned, and that one of my men should make brothers with the chief, and that we should exchange presents and be good friends. While that was going on another large party came in, headed by a chief, who told the people of the village that they should not be such fools as to make peace with us, as we were a very small caravan, and they would be able to kill or make slaves of the whole of us, and share our beads and stores amongst them. When they arrived the people again began shooting at us. I would not allow my men to fire for fear of breaking off the negotiation, until the men closed in throwing their spears at us. I then fired two or three shots close to some of the natives, set fire to one of the huts in the place, and told the chief that if he did not take his men off I would burn the village down. They had already burned our camp. On this he said that if we went away from the village we could go unmolested. At every

slip of jungle the natives closed in upon us, shooting, and we had two or three men wounded; but it was next to useless returning the fire, as we could not see them, and being short of ammunition I was afraid of wasting it.

At sunset we arrived close to a village called Kamatété (which I afterwards renamed Fort Dinah, in memory of the goat), and I told the guide to say that we wanted to be friends and to camp there. Their only answer was a volley of arrows. As we were unable to stop out in the night in the jungle with all these fellows round us, I called out to my men to follow me and storm the village. Four men followed me; the rest, except one or two men with Bombay, who was told to look after the stores, ran away. Luckily, the natives ran the other way. When we got into the village I burned all the huts down but four, and my men coming up set to work to make a fortification. Here we remained five days. We were being constantly shot at, and some men wounded. We were, fortunately, close to water and plantations of cassava, so that we were well supplied with food and drink. The guide told me we must shoot some of the natives before we could get out of our prison, and at last I was forced to use my gun. The report of my heavy rifle they soon learned to respect. At the end of five days we made peace, they having been frightened by some of their people being killed and wounded. The natives, after the fight was over, offered an indemnity, which, however, I did not accept; but we exchanged presents as a token of friendship. The result of these various interruptions was, that I had to content myself with a distant view of the lake. The fourth section of the journey was from Kasongo capital to the west coast of Benguela. We passed nearly along the watershed between the Zambesi and the Congo until we arrived in the basin of the Kwanga.

I arrived at Benguela on the 4th of November. At the first camp we were delayed by people going to look for their

runaway slaves. The next morning, when I was ready to start, a message came, 'No march. Kwarumba is coming up with his slaves.' Kwarumba arrived that afternoon with a string of fifty or sixty wretched women carrying heavy loads of plunder, and some of them with babies in their arms; these women represented as many as forty or fifty villages destroyed and ruined, most of the male inhabitants having been killed and the rest driven away into the jungle to find what subsistence they could, or die of starvation. I have no doubt these fifty or sixty slaves represented upwards of five hundred people either killed in defending their homes, or who had died of starvation afterwards, besides a much larger number rendered homeless. All these women were tied together round their waists with thick knotted ropes, and if they lagged on the march were most unmercifully beaten. The Portuguese half-castes and black traders are most brutal in the treatment of their slaves; the Arabs, on the contrary, as a rule treat them kindly. Slaves taken from the centre of Africa like these do not, as a rule, reach the coast; on the contrary, they are taken down to Sekeletu's country—where, owing to several causes, the population is scanty, and slaves are in demand—and are sold for ivory, which is afterwards brought to the coast, a caravan usually making a journey towards the centre and then on to Sekeletu's country, and so on alternately. All this country was very beautiful with hills and woods, and marvellously fertile. Here we were beginning to rise out of the broad valley of the Lualaba, and as we came to a height of about 2600 feet above the sea the oil-palm ceased to flourish. From this place we went on through Ulúnda, which name means wilds or forests. After Ulúnda we came into Lovale, and passed close to the sources of the Lubea and the Zambesi; beyond these we came to enormous plains, which in the rainy seasons are covered with water about knee-deep, and this extends across between the affluents of the Congo and the Zambesi. I passed across

Dr. Livingstone's original route from Sekeletu's to Loanda, and found that the people still remembered him from the fact of his having had a riding ox.

We arrived late at Kagombé's, the chief of all Bihé. This town was the largest I had seen in Africa, being four or five miles in circumference, but a large portion of the interior was taken up by pens for pigs and cattle and tobacco grounds. There were also three gullies, in which were sources of streams flowing to the Kokema. I had to present King Antonio, as he called himself, with a gun, and a leopard-skin which I had had spread out in the hut that was given me to sleep in. When the secretary, who could not write, called to see me, I was told I must give him something, or else there would be trouble. The next morning I went to see King Antonio, and first of all went into a small outer court, the doors of which were guarded by men wearing red waistcoats with white backs, whom he called his soldiers. Some were armed with bows, and others with spears, and a few of them with old flint-lock muskets. They only put down a stool for me to sit on, and brought in a large leather chair studded with brass nails for Kagombé. On this I sent up to my hut to get my own chair to sit on.

After a time King Antonio arrived, dressed in a suit of black clothes and an old wide awake hat, but without any boots, and a Scotch plaid over his shoulders, and held up by a small boy, and looking very drunk indeed. He first informed me that he was a very great man, but that as he had heard I had been so long on the road he did not want a great present; but I must remember him if ever I came there again. He also informed me that he was not the same as any of the other chiefs in Africa, because his name was Antonio Kagombé, and that his likeness had gone to Lisbon; and I must not think he had not finer clothes than those he had on, because he had clothes with gold lace and other fine things. After a while we went into an inner inclosure, and there the stools and

chairs were arranged in a circle, and he went to one of his houses and brought out a bottle of aguardiente, and wanted everybody to have a drink round, but he took good care to have the largest sip for himself; after which there was a little palaver, and I went away to my hut, and the next morning I got away and marched over to a house of Señor Gonsalves. Here I was astonished at finding myself in civilization once more. Remaining there one night, I marched through an open prairie country, with a few bushes and trees, and intersected by many streams, to the settlement of Joa B. Ferreira, who enjoys the position of a district judge, on account of his having travelled a good deal. Kisanji was the first place where we found that milk was to be got, although the first where we saw cattle was in Lovale. From Kisanji to the coast there are no inhabitants, the whole being a desolate tract of mountains, the marching lying through passes and over granite rocks, skeletons lying by the side, showing the severity of the march, signs of the slave-trade still remaining in slave-forks and clogs lying by the roadside.

After leaving the pass, we went across a barren plain till we came close to the coast, and then we came upon what appeared sea-cliffs facing the land, as if a continent had sunk in what is now the Atlantic, and Africa had been upheaved afterwards. At forty-five miles from the coast we sighted the sea, and our feelings were even more thankful than those expressed by Xenophon's Ten Thousand.

The main point of the discoveries I made I believe to be the connection of the Tanganyika with the Congo system. The Lukuga runs out of the Tanganyika, and

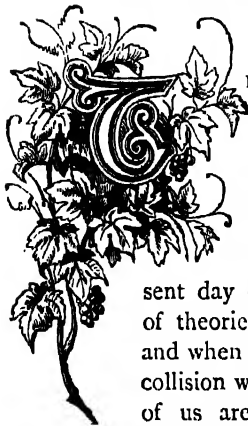
there is no place to which it can run but to the Lurwa, which it joins at a short distance below lake Moero. The levels I have taken prove most conclusively that it can have nothing whatever to do with the Nile. The blot upon this fair country is the continuance of the slave-trade, which is carried on to a great extent to supply those countries which have already had their population depleted by the old coast trade.

The chiefs, like Kasongo and Meta Yafa, are utterly and entirely irresponsible, and would give a man leave, for the present of two or three guns, to go and destroy as many villages and catch as many people as he could for slaves. The Warua especially, although holders of slaves, would rather die than be slaves themselves. I have heard instances of their being taken even as far as the island of Zanzibar, and then making their way back, single-handed, to their own country. The Portuguese are the principal agents in this trade, as they are able to dispose of them advantageously for ivory and other products in many countries. The Arabs, as a rule, only buy enough slaves to act as their porters and servants for cultivating the ground round the permanent camp. The people of Bihé, who work under the Portuguese, are most cruel and brutal in their treatment of these unfortunate wretches. I have interfered sometimes, and would have interfered far oftener if I had not found my interference brought a heavier punishment on the unhappy beings when my back was turned. The only thing that will do away with slavery is opening up Africa to legitimate commerce, and this can best be done by utilising the magnificent water-systems of the rivers of the interior."



MARVELS OF MEDICAL SCIENCE.

THE OPHTHALMOSCOPE AND THE SPHYGMOGRAPH.



THE good old "rule of thumb" was never in less force than now. "I don't believe in your practical men" is a phrase of the present day cant. It is an age of theories rather than facts; and when the former come in collision with the latter, many of us are inclined to agree

with the Frenchman that the facts have the worst of it.

Medicine is particularly fertile in new methods, and wonderful are the developments of what we may be perhaps allowed to describe as the mechanics of medical science.

The age of "symptoms" seems to be fast passing away, and it appears not improbable that the physician of the future will no more think of asking his patient a question than he now thinks of believing all he gets by way of answer. Of course the fashionable "lady's doctor" will still devote attention to prolix descriptions of ailments, and will preserve the gravity which is an evidence of his sympathy and his comprehension; but ordinary and less interesting patients may expect to find their maladies determined by purely mechanical process.

We all of us know that the skilful mariner sent adrift on an unknown sea, give him but his sextant and a view of the heavens, will detect exactly the whereabouts of his vessel; and it would seem that the medical genius of the period is greatly exercised in the production of instruments which shall define accurately the disease under notice, and the precise stage in its development at which it has arrived.

There are two inventions now in every-

day use in hospitals and consulting rooms which may be fitly described as "marvels," and so claim a notice in these pages. They are called respectively the ophthalmoscope, with which to observe the structure of the eye, and the sphygmograph, an instrument to record pulse movements.

In neither case is the idea altogether novel, but it is only of recent years these appliances have ceased to be regarded as curiosities, and have been rendered so excellent in construction and so reliable in action as to become the trusted helpmeet of the scientific physician.

The Ophthalmoscope.—The ophthalmoscope consists of a lamp, a mirror, and a magnifying lens. The mirror, which has a hole pierced in its centre for the observer to look through, is so placed as to direct a ray of light upon the eye of the patient; and the eye, enlarged by the action of the lens adjusted to the proper focus, is presented piece by piece as the position is shifted, until, if necessary, the whole organ has been subjected to examination.

Like a trusty watchman turning his lantern upon suspected places, and dragging to light hidden dangers, so by bringing the ophthalmoscope to bear upon the wonderfully complex structure which affords us vision, the skilful observer is enabled to examine every nook and corner, and to detect abnormal conditions which lurk in bye-places, and threaten the safety of that priceless jewel—the sight.

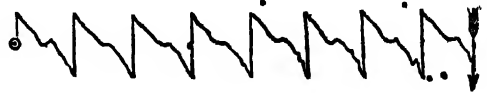
Nor does the use of the ophthalmoscope stop here. The eye may be regarded as the index of the brain, and in studying the former the physician obtains an insight to the latter, and is enabled to diagnose with certainty many terrible and obscure maladies whose advent and extent could be otherwise only assumed.

Take the common case of a headache. Here are two patients suffering from headache. Ask them questions, and the replies are similar; it seems that the seat of pain, the character of the pain, and its duration are alike. The practitioner, who depends solely upon the information he gains in this way, will often work altogether in the dark. His more scientific brother will address some of his questions to the little instrument beside him, and receive from it far more trustworthy answers. A pill or draught may suffice in one of the cases, but the other patient is shown to be suffering from very different causes.

The use of this invaluable little instrument has marked a new era in the diagnosis of maladies having their origin in some lesion of the brain. By its aid that most awful group of diseases called "nervous" is brought much more within the ken of the physician. Their advent may be determined whilst yet they are in the earlier and incipient stages, and at a time when they are more likely to prove amenable to treatment.

The Sphygmograph.—The sphygmograph is an instrument of a different character, useful in the extreme, and, as a piece of mechanism, highly interesting. It is more thoroughly mechanical than the ophthalmoscope. The latter is applied to an existing structure of which it presents to the observer an enlarged duplicate for his investigation and study. The former is more self-dependent. It not only exhibits, but it records. It examines, and writes off the results of its examination. It works thus:—A spring is made to press upon the artery in the patient's wrist in the same way that the doctor's finger would in the familiar process of "feeling the pulse." The motion of the pulse is communicated to a lever, furnished at the end of its long arm with a point, turned at a right angle. This point or nib is placed in contact with a slip of paper previously smoked in a flame, and affixed to a thin metal plate, which is moved horizontally by clockwork; and, as the paper is drawn past the nib, the latter

exhibits, by scratches upon the blackened surface, the exact action of the patient's heart. The physician need be at no pains to study the record until he is at leisure. A dozen patients' pulses may be taken, the instrument may be returned to its case, and the papers placed in his drawer until there is opportunity for examination. Here



are copies of two such records. The first is the tracing of a healthy pulse, regular as machinery. The second is unsatisfactory;



it is the record of a heart's action weak and irregular.

So plain is the sphygmograph in its language, that it appears perhaps a little too candid to be pleasant; and it is not altogether an instrument one would recommend to a nervous man for experiments upon his own person or family. But in its proper place, upon the physician's table, it performs valuable services.

Whether with these and many other improved and improving mechanical aids, and the more thorough and systematic investigation of disease, which is a feature of the present day's teaching, our physicians will be able to make average life longer and stronger, time must show. If the medical mind have any such ambition, let us hope it will be gratified. In any event we are not likely to be enabled to dispense with doctors altogether; and if high science really should threaten the good old rule-of-thumb gentlemen with extinction, let us trust their successors will not prove a whit less kindly and sympathetic, and that they will not become too dependent upon an instrument which, however admirable in design and accurate in action, may be accidentally left behind, or of which it may be necessary to admit at a critical juncture—"it won't go!"

THE BURNING AT PRIESNITZ.



ONE afternoon in February, 1857, an aged man, with an iron-grey beard, was sitting in a coffee-house at Lyons, reading the newspaper. He appeared to be only passing away the time, for he glanced with indifference at his pages, and nothing excited his attention. All at once, however, his features became rigid, his eyes were eagerly fixed on one passage, and his whole frame showed deep emotion. Soon afterwards he laid the paper slowly down on the table, and leaned back, absorbed in thought. Rising after a few minutes, he seemed to have taken up his resolution. He left the coffee house, walked down the street, and entered the counting-house of a friend. After a short greeting, he said hastily, "You have business connections with Leipzig; are you going thither soon, or do you shortly expect any one to come from that place?"

"I shall not go to Germany before the summer, but I expect some gentlemen from Leipzig to be here in the course of a little time."

"I should be much obliged by your informing me of the arrival of one of these gentlemen. I have just read something in a newspaper which has called up one of the most terrible episodes in my soldier life. There must be a man now living in Leipzig who played a conspicuous part in that scene. I should like to know whether this really is the case, that I may ask him to give me some further account of that event and its consequences."

The manufacturer promised to give him the desired information. After a fortnight, the old gentleman repeated his visit, to ascertain whether any one were come from

Leipzig. "I have not time to wait long," said he: "I am eighty years of age, and must be ready for death at any time, and I shall meet it more calmly if I have a good account from Leipzig."

At last a commercial traveller from Leipzig visited the manufacturer. He was informed that an old military man earnestly wished to speak to him. Accordingly he called on the old gentleman. The latter, George Antoine Augustin Govéan, a retired officer in the French army, told him that he had read an account in a French paper of the simple but affecting celebration of the fiftieth anniversary of the sixteenth of October, 1806, in the village of Priesnitz, near Naumburg, in Saxony. He related further, that he had had a great share in the frightful events which had taken place there, which had given rise to that anniversary; and that consequently he wished to know how the inhabitants had fared since that time, and whether the young man who had spoken so bravely in favour of his fellow-townsmen was really the superintendent Grossman, and no other.

It was finally agreed to write down these questions, to lay them before Grossman, and to request him to write an answer.

Grossman joyfully gave a circumstantial reply, and this letter of his to Lyons, bearing date April 6th, 1857, was the last he ever wrote. The letter of thanks which Govéan wrote in return arrived when Grossman was on his dying bed, and he was only able to be made very imperfectly acquainted with its contents. From this letter of Govéan, and the pamphlet on the "Burning of Priesnitz," published by Grossman in 1810, the following account is drawn up.

On the day after the battle of Jena, Wednesday the 15th of October, 1806, many of the French soldiery were scouring the country, robbing and demanding money.

Between the village of Ranschurtz and a new inn, in a hollow of the road, some of the marauders were overtaken by the enraged peasantry, and murdered.

At the same moment a French baggage-wagon came by, with a feeble escort. As soon as these soldiers saw what had happened to their comrades, fearing a similar fate, they cut the traces of the wagon, left it sticking in the road, and fled to relate what had happened. "Very early in the morning of the 16th of October," relates Govéan, "Guigner de Revel sent for me. He was commandant of the 3rd regiment of the Line, in which I was captain of grenadiers, and which was then quartered in Naumburg. He showed me an order from Marshal Davoust, to surround the village of Priesnitz, and, as some French soldiers had been murdered there, to shoot all the inhabitants, with the exception of women and children, and to burn their houses to the ground.

The commandant was in the highest state of excitement at this cruel order. He threw his sabre on the ground and exclaimed: 'Have I lived to my present age to see such horrors, and to be entrusted with their execution?' He declared that he would rather break his sword to pieces than burden his conscience with such a bloody deed, and tarnish the French arms with such barbarity." It was difficult for Captain Govéan to pacify his brave Commandant, and to convince him that it would be giving a bad example of insubordination, if he dared to oppose so plain a command. With a heavy heart, Guigner at last gave the order to march back to Priesnitz. The village was surrounded. Those of the villagers who were able, concealed themselves or escaped. In a moment, however, the soldiers were in the houses. All whom they met were driven out of the village, just as they were—no one knew whither or wherefore. Grossman, who was in the house of his father the pastor, was among the inhabitants who were driven out. He understood French, and courageously approached the commandant, to ask him what

they had done, and what destiny awaited them. In answer, he received a written proclamation to this effect: "The inhabitants of the village of — have had the audacity to murder Frenchmen passing through their territory, and have stopped and plundered a transport. It is necessary to make a terrible example. The inhabitants of the aforesaid village, with the exception of old men, women, and children, are all condemned to death, and their houses to be set on fire.—Naumburg, Oct. 16th, 1806."

When Grossman understood the state of affairs, and the impending danger, he had a conference with the French officers, in which he forcibly represented the innocence of the inhabitants of Priesnitz, and called their attention to the mistake through which they were to suffer. Grossman's warm representation made a deep impression on the commandant Guigner de Revel, and he wished to march his battalion off without executing the marshal's orders. He was only prevented from pursuing this plan by his officers making a new proposal. They wished to send a messenger to Naumburg, to inform Marshal Davoust that the village of Priesnitz appeared to be innocent of the alleged crime; that there were other villages with somewhat similar names, and that it seemed desirable to suspend the execution of the punishment.

A horse was accordingly brought, and Lieutenant Sico mounted and rode off; but who can depict the terror which was felt during his absence. At seven in the morning the people had been driven out to the spot, since called the Place of Terror, and it would be eleven before Sico could return.

Meantime, more men and women, who had concealed themselves, were driven out. Children cried for bread; an old man of eighty, leaning against a hedge, seemed almost frozen; the women, mostly half clad, wept aloud; and even strong men trembled, for a cold wind blew, and thick hoar-frost covered the ground.

At length the returning officer was seen approaching at full gallop. Did he bring

with him life or death? He dismounted, and the other officers gathered round him. And what was the answer of Marshal Davoust? It was short and severe: "The order is immediately to be executed." The unfortunate people of Priesnitz were scarcely less dismayed than the commandant Guigner. He was in a most difficult situation; for he could not come to the resolution of executing the order, and yet he did not wish to be openly disobedient. "Then the happy thought occurred to me," writes Govéan, in his letter to Grossman, "to say that he could march off, and leave me to execute the order, for that I and my company would remain."

The commandant immediately retired, and only Captain Govéan and his company stayed behind. He had the trumpet immediately sounded, and sent some of his men with burning torches round the village, to set fire to a few houses and barns on that side where the wind could do the least damage. The flames burst through the thatched roofs. While this was going on, the terrified inhabitants were weeping and wringing their hands as they witnessed the destruction of their property; Govéan's grenadiers quickly returned to the assembled crowd, so that no one any longer doubted that they were all going to be shot together. Govéan, however, only wished to frighten the people away, while he ordered his grenadiers to take some young men prisoners and detain them.

As soon as the miserable beings saw that they might flee, they ran breathless into the open country without looking round. Seven young men only were taken, and driven back to the former spot, the Place of Terror. "What they internally felt, no language can describe. With burning terror they fell to the ground, and one of them embraced the knees of the captain."


"I advanced myself," writes Govéan, "between them and the grenadiers, and then gave the word to load and present. If my men shot as I expected, all was right; if not, I should fall with the unfortunate creatures, whose life I had endeavoured to

preserve. At any rate, subordination, the pride of the French army, remained untarnished. And now, waving my sword, I said, 'Fire.' The grenadiers shot away over their captain, as he had expected, and over the poor creatures who were kneeling behind him. Immediately after the discharge, and before the smoke had subsided, Govéan quickly said, 'Turn to the right,' and without waiting, he led his company back to Naumburg, and announced officially, 'The order is executed.'"

The unfortunate seven who had been so near death, knew not how it was that not one of the shots had taken effect, but that the French were gone. It was long before they dared to stir. At last they rose, and standing beside a wild thorn bush under a large pear-tree, one of them opened his lips. It was the son of the schoolmaster. "Let us fall down on our knees," said he to the others, "and pray an earnest prayer, since the good God has preserved us." And the seven young men knelt down together and prayed, and thanked God.

On the Place of Terror, a simple memorial was afterwards erected, and every year, on the 16th of October, the deliverance was commemorated, without its having been, up to this time, exactly known how it took place. Now, however, they will especially remember the manly deed of Govéan, who thus concludes his letter to Grossman:—"I would willingly not have spoken of what I did myself on that unfortunate occasion; but it could not be avoided. I was compelled to relate what happened, and in what manner. The kind remembrance of a natural deed of humanity affects me deeply, and I am now doubly glad that I acted as I did. The commandant, Guigner de Revel, born at Chambéry, died five or six months after the occurrence, at Thorn, on the Vistula; and Lieutenant Sico, a Piedmontese, died about fifteen years since at Metz. I alone remain at the end of a long career, in which I have been near to all the sufferings and sorrows attendant on war, and I have often had occasion to testify that it leads to unnecessary severity."

AMONGST THE BAŞHKIRS.



IN the course of my tour amongst the Trans-Uralian mountains, I came one summer evening to an uninhabited Bashkir winter village, the inhabitants of which were, so to speak, "upon the tramp." The majority of the habitations consisted of one square block, narrowly resembling the peculiar compound called "wattle-and-daub" in some of our northern counties. The huts were neither thatched nor roofed; just simply covered in with clay and turf across some rafters.

Numbers of these sheds, surrounded by fenced-in spaces for cattle, were dotted about without attempt at arrangement, further than accident or the good pleasure of the builder had seen fit to appoint. The effect might be picturesque, but was certainly confusing. Dung heaps were scattered in all directions as promiscuously as the dwellings, intermingled with luxuriant weeds, and waving hemp, which nobody sowed and nobody would reap. Herds of half-famished dogs prowled among the tall grass and assaulted strangers' calves.

A visit to one of these places is equivalent to inspecting all; for they are invariably constructed after the same pattern. Along the wall and opposite the door runs a broad, low wooden settle or divan, wherein the entire family sit and sleep. The room is lighted by one little window, in which a bladder is substituted for a pane of glass. A large clay stove occupies one corner, beneath a hole in the roof permitting the escape of smoke. This is a summer arrangement, by the way. In winter or rainy weather the hole is stopped up by a wisp of straw, and the smoke gets out the best way it can. A few earthen pipkins and pots complete the furniture of the ordinary Bashkir household.

From a stray hunter our guide learned the direction in which the inhabitants of this village were to be found, and after a ride of six or eight versts we came in sight of the temporary dwellings they had set up. A nomad village is usually composed of several tribes, who, according to ancient custom, have pasture rights in common. Each family inhabits a separate yurt, the wealthier Bashkirs allotting a second habitation to their women. During the great heats of summer the felt is usually turned up a couple of inches from the ground, to admit the cooling breeze.

Upon arriving we were kindly received by the chief elder, and conducted to a yurt of the better class. This residence, though only temporary, was vastly superior to the shed we inspected in the winter village. Opposite the entrance was a similar broad divan, but covered with carpets and pillows. Chests, containing the family wardrobe, stood around the tent. Upon the walls hung spears, swords, fire-arms, and harness, occasionally also bows and arrows.

Here we were presented, as welcome, with a wooden bowl of *koumiss*, which it would be a serious breach of manners to refuse. In every yurt a large skin of this beverage stands beside the door. It is in a perpetual state of fermentation throughout the summer. Although in frequent requisition, fresh milk is constantly poured in by the women, who stir the mass up thoroughly with a kind of churn. There is no cover to the skin: flies, ants, and other equally unpalatable additions commit insecticide without the slightest opposition; but these are trifles quite unworthy Bashkir consideration. Cleanliness, in fact, of any description is entirely unknown; so that the only resource of the unfortunate traveller, presented with the welcoming bowl of *koumiss*, is to shut his eyes and hold his nose, quaffing the draught with all possible

expedition. One consolation remains to the afflicted mind: *koumiss* is said to be an excellent remedy for consumption and all respiratory diseases. Prepared with ordinary attention to nicety, it affords a thin, sweetish liquid, giving off very little cream, and highly nourishing.

The Bashkirs of these districts live principally by cattle-breeding: their chief possessions are horses and sheep—few horned beasts. Some few among the wealthiest own upwards of 500 horses, sent summer and winter into the steppes; for, as the pastures are of immense extent, and little or no hay is made, sufficient half-dried grass is always to be found, even when the snow lies several feet upon the ground. It is a curious sight to see thousands of horses roaming over the steppe, scratching away the snow with their fore-feet. In violent, drifting storms these sagacious creatures are found grouped in large circles, their foals in the midst, and the heads of all turned towards the wind, to prevent the snow from lodging upon their crests and manes. In other hands, and well looked after, the animals prove valuable from their hardy training. Numbers are annually brought to the Kazan fairs, whence they are sent into the interior of the empire: the mares are generally retained for breeding, or for the sake of their milk, which is bartered to the Kirghises.

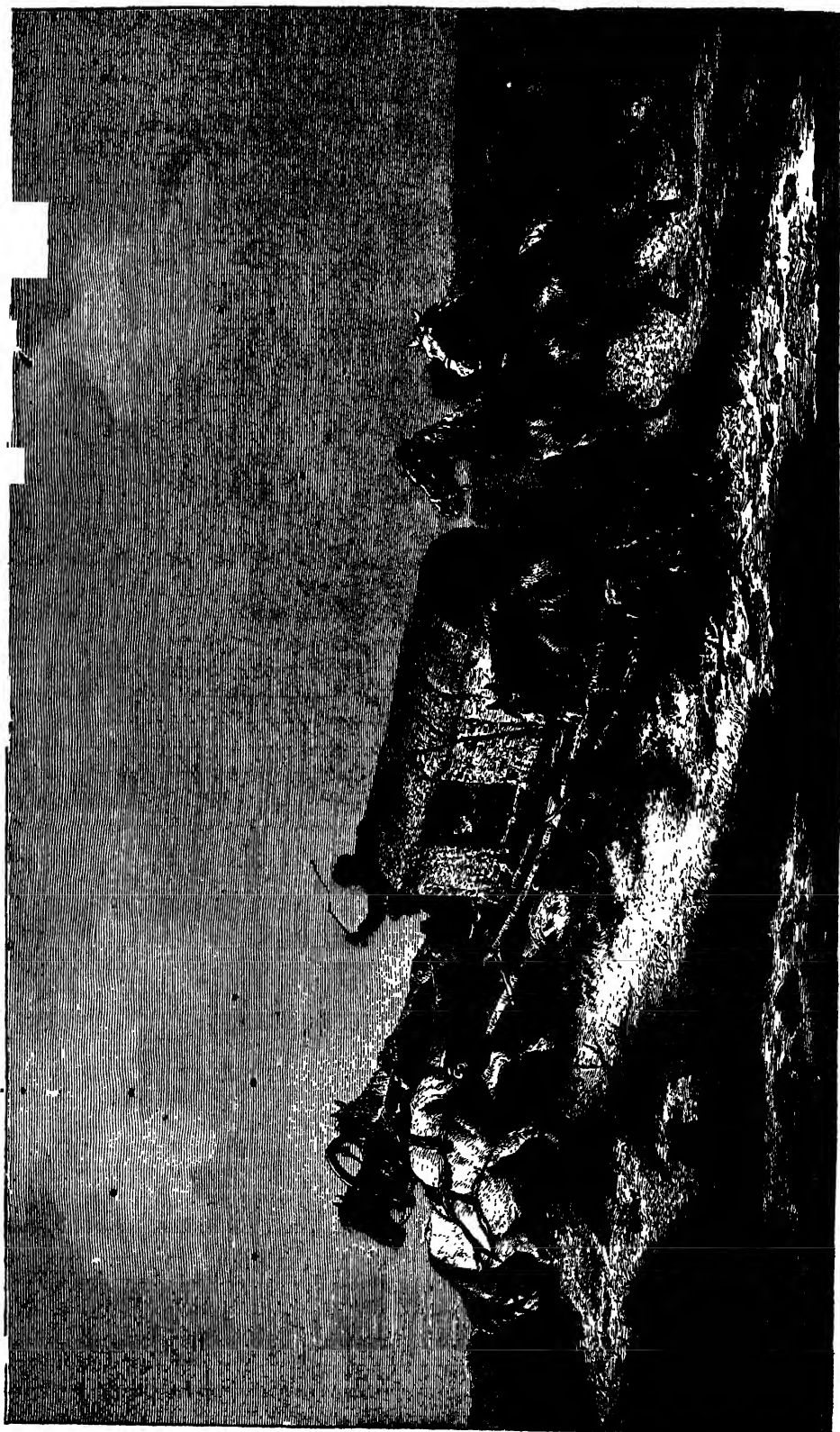
Among such masses of cattle, life in a nomad village is naturally noisy. Lowing, bleating, and neighing resounds on all sides. Animals meet the eye in every direction. The grass is trampled flat for miles. Men gallop to and fro, lassoing mares with the *arkan*; the women are occupied with milking and household labours; half-naked Bashkir boys roll upon the grass, or shoot blunt-headed arrows from their little bows; hundreds of tethered foals stamp with impatience, and neigh after their mothers, then being milked. Farther out in the steppe pasture are the larger flocks, out of whose midst rises at intervals the bulk of an unwieldy camel; and farthest away of all, the sombre range of the Ural, with its

steep precipices, wild passes, and primeval woods, fills in the background.

When the Bashkir is not occupied with flocks and herds, he lies lazily in the yourt, sips *koumiss*, and enjoys the delights of idleness. If actively inclined, he throws himself upon the first horse he can catch—for he is no pedestrian—and pays a visit to the nearest village. A sheep is slaughtered in honour of the guest, and *koumiss* is handed round in mighty bowls, so long as the remotest possibility of drinking it remains. No pen can convey a notion of the fabulous elasticity of the Bashkir stomach.

When all the pasture in the vicinity has been fed down, the felt tents are struck and laden upon camels. This office falls to the share of the women, upon whom, indeed, especially when getting old and wizen, most of the laborious tasks devolve. The entire horde then sets forth to gain "fresh fields and pastures new." The cattle lead the way, browsing as they advance, and guarded by a cloud of mounted skirmishers, ready to do battle in their defence. Then follow women, children, and the baggage; lastly, the officials and elders of the village; the whole, not excepting the children, on horse-back. A flitting of this description being esteemed a kind of festival, the fairer portion of the dusky tribe are decked in all their bravery, the richest wearing the peculiar Bashkir head-dress. This consists of a sort of smooth cap with head lappets, the whole affair covered with perforated silver coins. The numismatist might often make discoveries of value among these ornaments, which are especially rich in ancient kopeck pieces. The elder women ride unveiled; the younger invariably envelop their faces when a stranger appears, or modestly conceal their features as far as the eyes behind their wide-hanging sleeves.

Like the Kirghis, the Bashkir waits with impatience for the spring, when he can quit his narrow winter habitation, which is far less home to him than the green undulating steppe and the dark mountain passes of the Ural.



BASHKIRS SHIFTING THEIR QUARTERS.



THE MAMMOTH CAVE OF KENTUCKY.

PERHAPS the most remarkable cavern that has ever been discovered is that called the Mammoth Cave, in Kentucky. This cave has been explored to the distance of between nine and ten miles, but no boundary has been reached. "The mere extent of this excavation is sufficient to render it an object of interest; but the Mammoth Cave is not deficient in attractions in other points, though it is inferior to many other subterraneous cavities in the variety of its productions or in the beauty of its natural curiosities."

In the district where the Mammoth Cave is situated there are many other pits and caverns of lesser size, among the limestone formations of which that region is almost wholly composed. A deep pit leads to the mouth of the cave, which is thirty feet in width and from forty to fifty feet high, and which seems like some frightful chasm in nature, whose hideous yawn allures the adventurer to its interior, only to bring him into impenetrable darkness. After advancing two or three hundred yards, however, the lofty arch of rock over the visitor's head gradually contracts on all sides, and for several paces it is necessary for a man to stoop, though oxen are admitted with facility. The passage again expands to a width of fifty feet, and a height of about twenty, which continues for nearly a mile.

As the visitor approaches this part of the cave, an extraordinary spectacle meets his eye, which will remind him of the fabled labours of the blacksmith god, Vulcan, in the centre of Mount Etna; groups of men are here seen engaged with torches and fires in the labours of the cave, which consist in the manufacture of saltpetre, a substance yielded in abundance by the earth of which the floor is composed. The saltpetre is sepa-

rated by steeping the earth in water, which dissolves the salt, and afterwards deposits it by evaporation. This part of the cave is called the First Hoppers, and an exploring party generally supply themselves there with a torch to each man, which is rendered absolutely necessary by the strong current continually rushing from the cold cave to the warm atmosphere without, and frequently blowing out some of the lights. From the First to the Second Hoppers, where saltpetre is also manufactured, the distance is about one mile, and the cave is throughout nearly sixty feet high and forty in width. For almost the whole way between the entrance and the Second Hoppers, the loose limestone has been laid up into handsome walls on both sides, and a good hard road has also been made. Though a few torches cannot show it to perfection, the arches are in general regular, and the walls perpendicular. Before the Second Hoppers are reached, several passages of nearly equal size branch off from the ones generally followed, but the most of these return after a circuit, and intersect or join the main line.

Beyond the Second Hoppers the main passage expands to a height and width never less than sixty feet, which continues with little variation as far as the spot called the Chief City, an immense area, eight acres in extent, and without one pillar to support the arch which is entire over the whole. Nothing can be more sublimely grand than this vault, which mocks the proudest of human erections. The chief city is six miles from the mouth of the cave, and nearly straight from it, though the approach is very circuitous. Five lofty avenues lead from this great area, each from sixty to a hundred feet in width, and from forty to eighty feet high. Fire-beds of uncommon size, with brands of cane lying around them, are interspersed throughout the city. These fire-beds or fire-places are numerous in all

the avenues, of this extraordinary cave, though of less size generally than those now seen in the fifth city. They prove, beyond a doubt, that the subterranean world was once inhabited by human beings, but at what period of time it is impossible even to conjecture. One thing is certain, however, that the red men—whom we are accustomed to call the aborigines of North America, but who are really only the successors of a

race that has long passed away—knew nothing, in recent times at least, of these caves. Cane seems to have been the fuel employed in warming these subterranean hearths.

Much light, however, yet remains to be thrown on North American antiquities; and there is no spot, we think, more likely to assist in this, on further examination, than the Mammoth Cave.

THE BEWILDERED PONTIFF.



THE following curious illustration of dexterous sleight-of-hand, and of the bewilderment of the beguiled spectators, appeared some time since in a French memoir of a professor of the art. Torrini was the artist's name, or at least the name by which he was professionally known; and the scene (which is described by Torrini) took place in the Vatican, before the pope, Pius VII., and conclave.

"After having selected from my repertory the best of my tricks, I put my brains on the rack to imagine a something which, belonging to the moment, should present an interest worthy of so illustrious an audience. The evening before that on which my show was to take place, I happened to be in the shop of one of the first watch-makers of the city, when a servant came in to inquire whether the watch of his excellency the cardinal was mended. 'It will not be done before evening,' said the watchmaker; 'and I shall have the honour of bringing it to your master myself.' 'Tis a handsome and excellent watch,' said the tradesman to me; 'the cardinal values it at more than ten thousand francs, because, having ordered it himself from the illustrious Bréguet, he fancies it unique of its kind. Yet, what an odd thing! two

days ago a mad young fellow of this town of ours came to offer me, for a thousand francs, a watch by the same maker, exactly like the cardinal's.' 'Do you think,' said I, 'that this person has really any intention of parting with his watch?' 'Sure,' was the answer. 'This young spendthrift, who has already made away with his patrimony, has now come down to selling his family trinkets. He would be very glad of the thousand francs.' 'Where is he to be found?' 'Nothing easier; he never leaves the gaming-house.' 'Well, sir, I wish to make his watch mine; but I must have it at once. Buy it for me; then engrave the cardinal's arms on mine, so that the two may not be distinguished one from the other. On your loyalty depends the benefit you will draw from this transaction.'"

The watch was bought by the watchmaker, who knew his customer, and on comparison bore out the description—*was* duly engraved by the confederate—*duly* sent home—and duly deposited in Torrini's pocket, ready for the trick of tricks which was to close the evening. The pope neither believed in, nor had been dissuaded by, any tales of sorcery from countenancing the entertainment—feeling that, so far as sleight-of-hand went, he was a wondering layman, and the clever fellow brought in to amuse him, the priest of many mysteries. The exhibition accordingly went off capitally. "To end it," said Torrini, "and by

way of *bouquet*, I went on to the famous trick which I had contrived for the occasion. Here, however, I had to encounter many difficulties. The greatest of these, without question, was to lure the cardinal to give me his watch, and that without directly asking for it. To gain my point, I had recourse to stratagem. On my asking for a watch, many had been handed to me; but I had given them back, on the pretext, more or less true, that, offering as they did no peculiarity in shape, it would be difficult afterwards to identify the one chosen by me. 'If, Messieurs, any one among you,' said I, 'has rather a large watch (the cardinal's had precisely this peculiarity), and would entrust it to me, I should accept it willingly as the one fittest for our experiment.'"

The cardinal fell into the snare, and the conjuror examined and admired and asked questions about the cardinal's handsome watch, by way of *boniment*—the word in the French conjuror's dictionary for the preliminary talk which is to beguile time, and put an audience off its guard. But, to return to the cardinal's watch. After praising its capital qualities up to the skies—

"See," said Torrini, "a first proof of them." And with this he lifted up the watch as high as his face, and let it fall on the *parquet*. There was a cry of fright on every side. The cardinal, pale and trembling, got up. "Sir!" said he, with ill-restrained anger, "what you have done is an extremely bad joke!"

But worse was to come for the poor cardinal, who set such store on his Bréguet, 'Torrini stamped on the case, crushed it in pieces, and took up only a shapeless mass. The cardinal was in a rage; his watch (a chronometer, too!) was the only watch of the sort ever made; and Torrini handed about the heap of broken metal, that all might be sure that the broken heap *was* the cardinal's watch of watches.

"The identity of the cardinal's watch proved, the next feat was to get the real one into the pope's pocket. But there was no thinking of such a thing so long as his

Holiness remained seated. Some expedient for getting him out of his chair must needs be found. I had the good luck to find one. They brought me in a huge mortar and pestle, put it on the table, into which I flung the wrecks of the chronometer, and began to pound them with all possible fury. Suddenly, a slight explosion was heard, and from the bottom of the vessel came up a reddish flame, which gave the scene an appearance of real magic. All this time, leaning over the mortar, I pretended to look in, and exclaimed to myself at the wonderful things I saw there. Out of respect to the pope, no one rose; but the pontiff, giving way to curiosity, at last approached the table, followed by some of the audience. 'I do not know to what I am to attribute the bewilderment I feel,' said his Holiness, 'but I can see nothing.' It was the same with myself; but so far from owning it, I beg the pope to come round the table, to the side the most favourable for seeing that which I announce. During this evolution I slip into the pocket of the holy father the cardinal's watch. The experiment went on, the watch in the mortar was broken, melted, and reduced to the form of a little ingot, which I handed round to the company. 'Now,' said I, secure of the result I was about to obtain, 'I am going to restore this ingot to its primitive form, and this transformation shall take place during the passage it is about to make hence to the pocket of the person in this company the least to be suspected of confederacy.' 'Ah! ah!' cried the pope, in a jovial humour, 'this gets stronger and stronger. But what *would* you do, Mr. Sorcerer, if I were to demand that it should be in *my* pocket?' 'His Holiness has only to order, to have his wish obeyed.'"

The ingot was again displayed—of course instantaneously hidden (as conjurors can hide any small matter). Torrini cried, "Pass!" and lo! the cardinal's chronometer in the pope's pocket—safe and sound.

The next day the sorcerer received a magnificent diamond snuff-box.

CHASED BY AN ENGINE.

A CONDUCTOR'S STORY.



I WAS riding (says a writer in *Lippincott's Magazine*) on a night train of the Pennsylvania Central from New York to Washington on a mission as newspaper correspondent. We had passed Baltimore, and within an hour's time would be at our place of destination. The conductor had finished collecting the fares, and seeing a vacant seat by my side, had dropped into it as if for a little rest at the end of a tiresome day's work. He made an entry in his note-book, closed it, placed it in his breast pocket, buttoned his coat, folded his arms, and then turned to me with a friendly remark, as if now he felt at liberty to lay aside all official dignity and be sociable. I was glad to while away the time, as the train was rushing along in a darkness which concealed all objects of interest without, and so I encouraged the conversation.

"You must have met with some interesting experiences, and perhaps with some great dangers, in the course of your life," said I, the conductor's grizzly beard showing that he might have seen a long service.

"Well, perhaps the most exciting scene in my experience was the night I was chased by an engine,—a night which this one reminds me of," said he, looking out into the darkness.

"Chased by an engine!" said I, getting interested. "How did that happen?"

"Well," said the conductor, settling down in the cushion and bracing his knees against the back of the seat in front, "many years ago I was running the night express on Long Island from Brooklyn to Greenport, a distance of ninety miles, the entire length of the road. The Long Island was then a one-horse affair, having only a single track, with switches at the different stations to

allow trains to meet and pass. On the evening to which I now refer I started from Brooklyn at ten o'clock with the old *Constitution*, long since broken up, but then the crack engine of the road, with a baggage or freight-car and three passenger cars. The night was just as dark as a pocket, or, if anything, perhaps a little darker," he added, as if he had accurately tested the internal obscurity of that useful portion of the dress.

"It must have been very dark," said I.

"We were the only regular train upon the road that night, with the exception of the Greenport express to Brooklyn, which was to start at ten o'clock and meet us at Lake-land Station, in the middle of the Island, switching off there to allow us to pass.

"Well, we were perhaps six or eight miles on our way when I stepped out on the back platform of the rear car to see if it was growing any lighter. We were then going over a part of the road which was as straight as an arrow for a distance of four or five miles. As I was looking back over this stretch I saw behind us, at the distance of three miles or so, what I knew was the headlight of an engine, as it was too bright for anything else; for of course I did not suppose the Government had been putting up any lighthouses along the road."

"Probably not," said I.

"You may be sure I was a little surprised," said the conductor, "for there wasn't an extra train once a week upon that road, and I knew that there was none going out from Brooklyn that night, anyhow. I waited for a few minutes, until I saw that it was really an engine coming, and, what was more, was gaining rapidly on us, although we were going at our usual rate of speed. When I was satisfied of this fact I hurried forward and said to the engineer, 'Jake, there is a train close behind us.'

"Jake dropped his oil-can and his lower

jaw at about the same moment, and looked to see whether I was crazy or joking.

"Well, let the fireman attend to matters here, and come back and see," said I.

"We hurried to the rear, and in a moment Jake saw as well as myself that if there was any joke in the matter we were the victims of one; and of rather a serious one too, for the train in the rear had gained on us a full mile while I had been forward. The red cinders were pouring out of the smoke-stack as if from a blast-furnace, the head-light threw a glare along the road burnishing the iron rails to our very wheels. Close as he was upon us, the engineer of the advancing train had not given the slightest signal to warn us of his approach, and made no response to our repeated whistles of alarm. He was violating all railroad rules, and if he had determined to secretly run us down he would act just as he was then doing. Jake at first seemed to be struck dumb—not so much because he then thought of danger, as at the cool impudence of the engineer behind. He looked as if he would like to throttle him. His tongue after a while got into working order, and he broke out, 'What does that crazy fool mean?'

"The engineer must be either crazy or drunk," said I. 'If he keeps on in that way ten minutes longer he will surely be into us;' and I signalled the fireman to put on more steam. 'What business the train has upon the road at all to-night is what puzzles me.'

"I wonder if it isn't an engine the old man is sending down to Jamaica to the shop for repairs," said Jake. 'I saw the *Ben Franklin* standing on the side track with steam up just as we started. From the way she overhauls us, there can't be much of a train behind her.'

"I did not know but that Jake might be right, for I had seen the *Franklin* standing in the depôt when we left. That engine was just as fast as our own, and if it was without a train attached, as Jake supposed, might easily gain on us, as it seemed to be doing. 'At any rate, we shall see when we pass Jamaica Station whether Jake's theory is correct,' I thought and said to him.

"By this time the fireman, acting as engineer, had given our engine all the steam she would take, and we were slashing along at a lively rate, I tell you," said the conductor. "The good people along the road who were out of their beds must have thought that a railroad Gilpin was riding another race according to the new style. I was angry enough to have sent a bullet at the crazy engineer following us, and I determined that my first business the next day should be to complain to the superintendent of his foolhardiness. I thought that possibly, being for the moment his own master and no longer under the immediate orders of a conductor, he was indulging in a kind of railroad spree, and for a lark was driving up to the top of our speed, expecting to end the race and his day's work at the same time at Jamaica.

"Well, we tore through that sleeping village without stopping long for refreshments, I can assure you, and then Jake and I looked to see our comical friend in the rear pull up at the station and take lodgings for the night. But we were mistaken in our guess. Not a whistle was given by our pursuer as a signal that he intended to stop: not a sign of slackening was shown; but, on the contrary, he was gaining upon us even when we were doing our very best. Sometimes a curve in the road would shut him a moment from our view, but he would round it in an instant, and every new turn brought him more closely upon us. Jamaica had been left far behind, and we were out on the wide Hempstead plain. The old *Constitution* was on her muscle. Our train was actually swaying and rocking, with the speed like a yacht on the waves. The telegraph poles, upon which the light from our windows would glint in the dense darkness, were flying behind us at every second. The sound of our wheels as they struck the ends of the rails was a continuous hum. But do the best that it might, our engine with its heavy train was no match for the light-weighted one behind that was gaining upon us, and was not the eighth of a mile off. The glare from its lantern shone

brightly in our faces. I thought Jake's face looked a little pale, and perhaps mine did too. Now that our pursuer did not halt at Jamaica, we were entirely off our reckonings, and we could make no guess as to the cause of our chase nor when it would end. The prospect seemed that we might be driven to the end of the road, if we were not overtaken and smashed before it could be reached.

"That's the *Franklin*, sure," broke out Jake once more. "No other engine on the road could overhaul us as we are going now. What can that fool of a Simpson mean by driving her at such a rate? He must be drunk. If the boss don't break him to-morrow he won't get his deserts. He will be into us in two minutes."

"You are right, Jake," said I. "Go forward and see if you cannot get up a little more headway. Empty a few of those petroleum cans on the wood, and pitch it in and see what can be done."

"While Jake was forward on his errand I thought over the situation. Here I was with a hundred or two passengers under my care, all ignorant of the danger which I knew they were in. If we should be overtaken and crushed in the rear, the disaster would be a serious one, and would probably cause the death or injury at least of some of the passengers. If we were not smashed in this way, there was another and perhaps a greater danger before us. The train of which I have spoken, which left Greenport when we left Brooklyn, was on its way to meet us on the same track. It should switch off at Lakeland in the middle of the island and allow us to pass an hour after we started, or at eleven o'clock. It was now half-past ten, and we were close to Lakeland already, and would pass there long before the arrival of the Greenport train, which ordinarily got there first. The result would be that we should meet that train beyond Lakeland without warning of our approach, and a collision in front as well as the rear would be the consequence.

"We reached and flew through the Lakeland depôt nearly half an hour ahead of

time. Of course the Greenport train was not there, yet, but was coming down the road. Our speed was now a little ahead of any ever before made upon the Long Island road. The telegraph poles fairly danced behind us, and the bushes on either side of the track seemed a continuous wall of fire as they were lighted up by the flame which was pouring out of our smoke-stack. But dangerous as it was for us to keep on, it was just as dangerous to slacken speed, and so on we went."

The conductor rolled his quid from one cheek to the other, raised the window by his side and expectorated into the outer darkness, and became silent for several moments as if burdened by the recollection of his former perils. After waiting a reasonable length of time for him to resume his story, I said, "When the collision occurred, was it with the train in front or in the rear, or with both?"

"Oh, the collision!" said the conductor. "Well, now you come to the ridiculous part of the story. The collision did not take place at all," he said in an apologetic tone, as if there ought to have been a serious accident after so much preparation. "While I was standing on the platform thinking whether I had better warn the passengers to hold themselves ready for a shock, Jake came along dragging after him two large petroleum cans, each of which would hold a quarter of a barrel of oil."

"Now, then," said Jake to me, "if you will oil one side of the track, I will try the other."

"I saw at once what his plan was! We each brought the mouth of an oil-can as near to the polished surface of the rails as possible and commenced pouring on it the kerosene. In less than a minute half a mile of the iron rails on both sides was nicely oiled, and as slippery as the tongue of a Hebrew dealer in second-hand clothes."

"You have raised my expectations of a catastrophe so high that you have been obliged to grease the track so as to let them down again easily," said I, for I felt a little nettled at the unexpected turn the

story had taken, and was inclined to believe that the conductor was drawing largely upon his imagination for the facts.

"Why, don't you know that an engine can no more make headway on a greased track than a tom-cat can climb a steep roof covered with ice?" said the conductor, with a pitying glance at one so profoundly ignorant of railroad matters as myself. "I slapped Jake on the back, and said, 'Old fellow, your 'cuteness has brought us all out of a bad scrape.'

"In a few seconds the lantern of the train behind us was getting dim in the distance. We slackened speed and backed down to see 'what the matter was with Simpson,' as Jake said. There stood the old *Ben Franklin* puffing and snorting and pawing like a mad bull, the driving wheels buzzing around on the greased track like all possessed, but not gaining an inch. We sanded the track and bore down upon the old machine. Jake was the first aboard, spoiling for a good chance at the engineer Simpson. But no sign of engineer, fire-

man, or any other living being was to be found. The engine had only a tender attached, and although there was still a full head of steam on, the fires were getting low. We made short work in pushing back to Lakeland. We reached the station, and got fairly upon the switch when the Greenport train, which we should meet there, came in, and were waiting as if nothing had happened, and as if we had not been fifteen miles out on the road to meet it a few minutes before.

"The telegraph operator at Lakeland handed me a despatch which read as follows:—

'To Conductor C——,—The *Ben Franklin* has broken loose and is coming up the road. Turn switch at Lakeland and run her off the track.—Brooklyn, 10.5 p.m.

BARTON, Superintendent.'

"You see, we did not have much time for turning switches at Lakeland," he continued, "so we did still better, and saved the old *Ben*—which was not responsible, after all—from a smash-up."



A FOREST ON FIRE.

AMONGST the contingencies of life in the Far West of America must be reckoned the danger of forest fires.

The woods are so encumbered with brush-wood, that in the dry season a spark is sufficient to cause a conflagration, the ravages of which may extend for miles. One of these terrible occurrences is thus described:—

"After toiling for an hour through a wide bottom of tall weeds and matted grass, I reached the grove, erected a small shed of boughs after the manner of the Indians, and, lying down, was soon asleep before a huge fire, which I built against the trunk of a fallen tree. I was awakened by the increasing violence of the gale. At times it sank into low wailings, and then would swell again, howling and whistling through

the trees. After sitting by the fire for a short time, I again threw myself upon my pallet of dried grass, but could not sleep. There was something dismal and thrilling in the sound of the wind. At times wild voices seemed shrieking through the woodland. It was in vain that I closed my eyes; a kind of superstitious feeling came over me, and, though I saw nothing, my ears drank in every sound. I gazed around in every direction and sat with my hand on my gun-trigger, for my feelings were so wrought up that I momentarily expected to see an armed Indian start from behind each bush. At last I rose up and sat by the fire. Suddenly a swift gust swept through the grove, and whirled off sparks and cinders in every direction. In an instant fifty little fires shot their forked tongues in the air, and seemed to flicker with a mo-

mentary struggle for existence. There was scarcely time to note their birth before they were creeping up in a tall, tapering blaze, and leaping lightly along the tops of the scattered clumps of dry grass. In another moment they leaped forward into the prairie, and a waving line of brilliant flame quivered high up in a dark atmosphere.

Another gust came rushing along the ravine. It was announced by a distant moan; as it came nearer a cloud of dry leaves filled the air, the slender shrubs and saplings bent like weeds, dry branches snapped and crackled. The lofty forest trees writhed and creaked and groaned. The next instant the furious blast reached the flaming prairie. Myriads and myriads of bright embers were flung wildly in the air; flakes of burning grass whirled like meteors in the sky. The flame spread into a vast sheet that swept over the prairie, bending forward, illumining the black waste which it had passed, and shedding a red light far down the deep vistas of the forest, though all beyond the blaze was a pitchy blackness. The roaring flames drowned even the howling of the wind. At each succeeding blast they threw long pyramidal streams upwards in the black sky, then flared horizontally, and seemed to bound forward, lighting at each bound a new conflagration.

Leap succeeded leap; the flames rushed on with a racehorse speed. The noise sounded like the roar of a stormy ocean, and the wild tumultuous billows of the flame were tossed about like a sea of fire. Directly in their course, and some distance out in the prairie, stood a large grove of oaks, the dry leaves still clinging to the branches. There was a red glare thrown upon them from the blazing flood. A moment passed, and a black smoke oozed from the nearest tree, the blaze roared among their branches, and shot up for one hundred feet in the air, waving as if in triumph. The effect was transient. In a moment had the fire swept through a grove covering several acres. It sank again

into the prairie, leaving the limbs of every tree scathed and scorched to an inky blackness, and shining with a bright crimson light between their branches. In this way the light conflagration swept over the landscape; every hill seemed to burn its own funeral pyre, and the scorching heat licked every blade in the hollows. A dark cloud of grey smoke, filled with burning embers, spread over the course of the flames, occasionally forming not ungraceful columns, which were almost instantly shattered by the wind, and driven in a thousand different directions.

For several hours the blaze continued to rage, and the whole horizon became girdled with a belt of living fire. As the circle extended the flames appeared smaller and smaller, until they looked a slight golden thread drawn round the hills. They then must have been nearly ten miles distant. And then the blaze disappeared, although the purple light, that for hours illumined the night sky, told that the element was extending into other regions of the prairies.

It was sunrise when I rose from my resting-place and resumed my journey. What a change! All was waste. The sun had set upon a prairie still clothed in its natural garb of herbage. It rose upon a scene of desolation. Not a single weed, not a blade of grass was left. The tall grove, which at sunset was covered with withered foliage, now spread a labyrinth of scorched and naked branches, the very type of ruin. A thin covering of grey ashes was sprinkled upon the ground beneath, and several large dead trees, whose dried branches had caught and nourished the flames, were still blazing or sending up long spires of smoke. In every direction barrenness marked the track of the flames. It had even worked its course against the blast, hugging to the roots of tall trees.

The wind was still raging; cinders and ashes were drifting and whirling about in almost suffocating clouds, sometimes rendering it impossible to see for more than one or two hundred yards.

CANVAS LIFEBOATS.



THE success of canvas boats, invented by a clergyman, the Rev. E. P. Berthon, of Romsey, Hants, is now fully established by their adoption by the Admiralty and India Board, as well as by their satisfactory employment privately in all climates. It is not easy to convey to those who have not seen these remarkable structures a clear idea of their peculiar construction, and their perfect adaptation to the various purposes for

which boats of any kind whatever can be used; but the following description, by the inventor, will best explain the merits of the system:—

“The grand and unique feature of this kind of boat consists in its combining great buoyancy and perfect *lifeboat* properties with the convenience of stowing

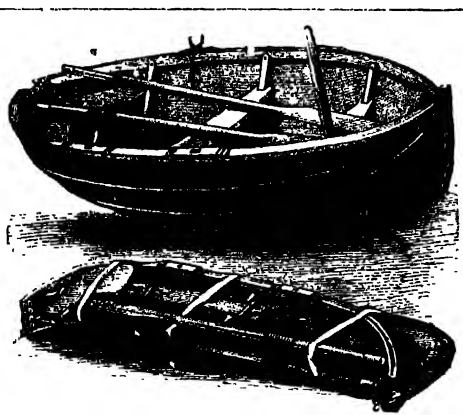
in about one-tenth of its actual bulk. These boats expand automatically by their own weight when wanted, and are ready for lowering in less than half a minute. They row and sail better than ordinary boats, and are perfectly safe in any sea. Their cost is little and their durability great.

In the first place, these boats are not inflated bags owing their buoyancy to distension, nor are they mere jointed frames with a canvas covering stretched over them. They do not sink, even when a large hole is made in any part. They have no transverse ribs, nor anything taking the place of the thwartships timbers in ordinary

boats. The framework of the boat consists of a number of longitudinal segmental planes or webs, which are broad and flat, and jointed together at the tops of the stem and sternposts. These lie in parallel planes side by side when the boat is collapsed, like the leaves of a closed book, and they stand out at different but definite angles, radiating from their common centre when open. These webs are constructed of the best Canada rock-elm, by bending long slips; softened by steam, one over another, on properly shaped moulds, till the required breadth is attained, and then riveted up to-

gether. The stem and the sternpost are connected to the keelson or inner keel.

Now let us suppose the skeleton of a boat thus set up for one of moderate size, and that the canvas skins, in lieu of planking, have to be put on. Long segments of the very strongest canvas are cut of a size and shape to reach from end to



BERTHON BOAT EXPANDED AND COLLAPSED.

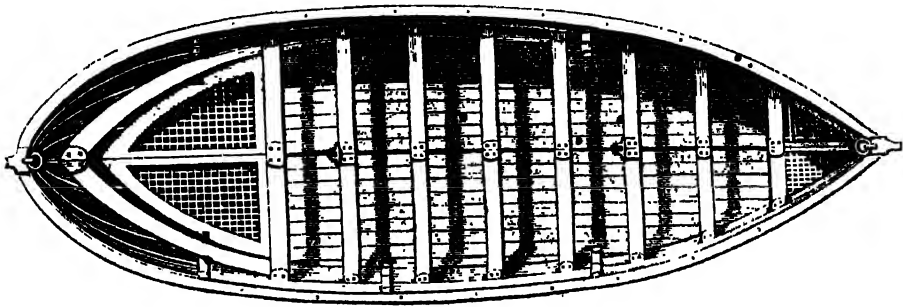
end and from plane to plane, to which they are firmly attached with copper tacks and white and red lead cement, and similarly under the keelson and up the stem and stern. A second skin of the same kind is now laid over the former and fastened in the same way. The outer keel, stem, etc., are next put on, and half-round bends of hard wood are screwed on over all the lines of tacks. We now have a boat capable of floating safely, and of enormous strength; so long as both these skins remain perfect, but it is not yet a lifeboat, for if filled with water it will sink like any other boat, and if a hole be made in it it will fill.

But remembering that the flat planes are very broad, varying from six to fourteen inches in a thirty-foot boat, imagine another set of segments of canvas secured to their inner edges in a similar manner, and the lines of tacks likewise covered with bends of wood.

We now have all the essential properties of a lifeboat, for the whole structure is divided into as many separate air cells as there are spaces between the planes—viz., four on each side; and should any segment of canvas be perforated, the effect is nothing more than the loss of buoyancy of that one cell or compartment. It will

be easily understood that air has to find its way into these cells in the act of expansion, as it does into a pair of bellows, and to be squeezed out in collapsing. This is allowed for by suitable openings at the top of each end. The bottom boards, thwarts, stem, and stern-sheets are all jointed to the inner edges of those respective planes, which are in the proper positions to carry them; and being also jointed along the middle line, they fold upwards, as in collapsing the planes fall downwards. The gunwale struts are likewise jointed, and act like the compass irons of a carriage head.

As to the nature of the metal joints for



GUNWALE PLAN OF THE BERTHON BOAT.

these boats, one uniform system of a new kind—an essential part of the patent—is used; it consists of alternate straps and links, at once the simplest and most effective possible. The masts step upon the keelson, and the rudder is hung simply in the ordinary way.

Any proportions or lines can be followed on this system, from the finest canoes to the bluffest barges; and they are built of all sizes, from that of an elegant skiff for one boy, to boats carrying 200 men, horses, artillery, etc. For small yachts they are invaluable, for the inconvenience of towing

a dingy is constantly felt by those who cannot carry it on board; but a collapsing dingy—a perfect little lifeboat, that will not sink when full of water—will lie in a space only six inches wide, and be ready for sea in less than a minute. Though it would not be fair to these boats to drag them far over shingle or sharp stones on a beach, they can be beached with perfect safety.

These boats are also admirably adapted for the purposes of fishing and shooting on rivers and lakes, as they are so easily transported."

LOGGING ON PUGET SOUND.



THE lumber or timber trade of the Puget Sound region in the north-west of America, has become a business of national importance. As the great forests of the Atlantic slope and the Mississippi valley have fallen before the woodman's axe, until every wayfaring man can 'see the nakedness of the land,' a small item of comfort may be found in the fact that there are yet remaining in the Puget Sound country some twenty million acres of the most magnificent lumber in the world. This does not include the sylvan treasures of the great State of Oregon lying south of Washington Territory, and the extensive timber ranges of Alaska, away up under the shadows of the North Pole:

Lumber is *the* great article of Puget Sound industry and trade. A description of the *modus operandi* of taking those sylvan giants, which stand in solid battalions all over so many of the valleys, uplands, and hillsides, from their native stumps, and placing them in the markets of the world, will doubtless be of interest to those who are unacquainted therewith.

To make a rabbit-stew, we must first get the rabbit; so to start a logging-camp, you must first get the timber-range,—that is, the land on which the timber grows. This is secured as near the tide-water of the Sound as possible, or else near the bank of some large creek or river, so as to save the expense of building long roads and hauling the logs over them to the nearest water in which they can be floated. It is quite an object in the way of saving expense to secure a "timber claim" near navigable water—navigable at least for the logs if not for the steam tug-boats by which they are

towed to the saw mills, which are sometimes nearly a hundred miles distant. This proximity to the water has another advantage in the fact that the roads from the timber-ground can generally be made level or sloping down hill. Sometimes, however, this object is not secured by such proximity. In such cases the road must be levelled by cuts or tunnels. One company dug a tunnel through a hill near Olympia about half a mile in length, and at great expense; but the pecuniary outlay was fully justified by the greater loads which could be transported through the tunnel than over the hill.

A "logging camp," when fully equipped, consists of a boss, or foreman, eleven men, and five yoke of oxen. A rude hut is built at or near the hall-way, called "the hovel," where the men sleep at night and smoke or read during stormy days and Sundays, when the camp is too far away from one of our little towns or villages to make a visit thither. Beside or near the hovel is the cook-house. Here reigns supreme one of the "fundamental officers" of a well-regulated camp. A good cook can do much towards keeping "all hands" of the rough and ready loggers in something of a Christian frame of mind at least three times every day.

The second officer in importance (the boss is not regarded in this enumeration of officials) is the chopper. His duty is to cut down the trees and measure them into logs of the proper length for the sawyer, who cuts with a long cross cut saw, operated by one man, according as the chopper marks out his work. The standard lengths for logs are 24, 32, 40, and 110 feet. The lengths into which the tree is cut are decided very much by its size and shape. For instance, a tree eight feet in diameter at the butt will most likely be cut into one of the 110 feet lengths on account of the difficulty in handling it. If a tree is a little crooked or tapers a little quicker than is

common; it will, of course, for obvious reasons, be cut into the shortest standard lengths.

The chopper usually cuts the tree about eight or ten, perhaps twelve, feet above the ground. To do this he makes a notch several inches deep into the body of the tree at a convenient height. Into this he drives and fixes securely a plank, upon which he stands, while, with a few hours' labour, he levels the sylvan monarch which has braved the storms of and cast its shadows over the earth for hundreds of years. All hands are warned by a shout to beware of and stand from under the falling giant, which comes down with a crash like thunder, often producing a respectable little earthquake felt sometimes several miles away.

The chopper is responsible for the position in which the tree falls, unless his calculations are disarranged by some extraordinary cause, over which he has no control. For ordinary lumbering purposes no tree less than eighteen inches in diameter at the butt is ever felled. There are various reasons why the trees are usually cut so far from the ground. Among others are the twisted and hard nature of the wood of which the butt is composed, its liability to be cracked, to have the cracks full of pitch or balsam, and to be decayed or imperfect at heart—for man is not the only creature which a bad heart condemns.

Some of these sylvan giants are of almost incredible dimensions, twenty-four to thirty feet in circumference, eight to ten feet in diameter, at the base, running up straight as arrows perhaps 350 feet, more than 200 feet of which is without a knot or limb, and at that height from three to five feet in diameter. Of course, these are extraordinary trees; some of them contain 25,000 feet of lumber. But if any "doubting Thomas" will come out to Puget Sound with the desire to satisfy himself upon this point, we can furnish the standing arguments needful to convince his mind that the extraordinary facts are true. I can even tell him of one fir-tree sixteen feet in dia-

meter measured with the surveyor's chain. But lest some honest reader might be misled by the above extraordinary figures, I will say that the trees of a good timber claim will average from 180 to 300 feet in height and from three to six feet in diameter, with from one to two hundred feet of clear, straight trunk, consisting of the very best spar, and ship timber produced by the forests of the world.

The chopper needs to exercise great care to fell those trees in the direction in which they shall be least liable to injury. The most level space must be selected, and all danger of lodging against other trees avoided. But, in spite of the utmost caution, it sometimes happens that a valuable trunk is completely shattered by the shock of its fall, and rendered entirely useless for lumbering purposes.

After the chopper has marked off the trunk into proper lengths, the sawyer takes charge, and proceeds to manipulate his long, cross-cut saw. The swamper next comes along and clears away the brush, so that the team can get in to the logs to haul them out to the skidded road. The "barkers" (of which there are two to each camp) take the logs in hand, and strip off the bark with an instrument like a chisel-pointed crowbar. This is easily done in the summer season, because the sap is then running. In the other seasons it is not an easy task; and so they only chop the bark off the "riding side," that is, the side upon which the log will be laid when drawn over the skidded road. This bark is often six and occasionally nine inches in thickness; and forms most excellent fuel, burning with a clear bright blaze, and lasting longer than oak or maple. The "hook-tender" follows the barkers, and snips off the corners of the logs so that round instead of square ends present themselves to any obstructions, as the logs are drawn to their destination. He also rigs a "fall" (block and tackle) when needed, and drives into the log the "dog," or hook, with a short chain attached, by which it is to be drawn to its destination.

The great man among the "officers" of the camp is the teamster. He generally has an ox team of five yoke, and has a vocabulary of profanity compared with which the common article is almost religious. There are exceptions to every rule, but it seems to be part of the necessary professional attainments of a first-class teamster, that he be profane, not in the common way—the oxen wouldn't mind that—but after a manner peculiarly and originally his own. Yet this same individual, who, when driving his team, imagines himself called upon to make the very atmosphere blue with profanity, may, around the cook-house table, or in presence of ladies or "a preacher," be the mildest-tongued man of all the camp. But among the many wonders included in the ups and downs of life, is the fact that this great swearing man is under the orders of the "hook-tender" while in the woods. If a log needs to be rolled into the road, or out of a new road, he has to take one or more yoke of his oxen and perform the task.

Two "skidders" are kept busy all the time in repairing the old or making new roads, leading from all points into the main track. Some of these side-roads are "skidded," and the main road leading to the "roll-way" always is. Those "skids" are small logs, from six to fourteen inches in diameter, laid across the road, bedded about half their thickness into the ground, and from five to ten feet apart. The bark is peeled off their upper sides, and they are kept clean with a broom, and regularly greased by the "skid greaser," who follows the team with a mop and a can of oily grease, which he "slaps" upon each skid in front of the row of logs, which have been "dogged" end to end, and are drawn by the full team, to the roll-way over this main road. The oxen are there unhitched. The dogs and connecting chains, by which the strings of logs were held together while being drawn, are thrown over yokes, and the

oxen wend their way back for another load at a pace so slow that it would almost disgrace a snail of lively disposition and ordinary locomotive powers.

From three to four thousand feet of lumber is a fair load for five yoke of oxen. Occasionally, instead of rolling the logs, a "shoot" has to be built, by which they are shot, one at a time, endwise, into the water. There are several of these shoots about Puget Sound, which are said to be at least half a mile in length. This mode of carriage is adopted when the peculiar formation of the shore requires it. There is, no doubt, considerable monotony about it to the men who have the hard work to perform of putting it in operation; but to him who is only an onlooker, there is something terrifically interesting in the awful rush and roar and plunge of those huge logs of timber; and I have often stood at a safe distance and watched them with something akin to terror, as imagination conjured up the possibility of some poor logger's becoming in any way involved in the furious rush of the fierce and for a few moments, ungovernable monster.

When once the logs are in the water they are easily handled. If not in navigable water, they are conveyed thither singly or in booms, and there arranged into an oblong square, surrounded by boom stringers, and towed by a tugboat to one of the sawmills, of which there are at least a dozen on Puget Sound. They are then sawed into lumber of varied dimensions, and shipped to the great outside world.

Some idea of the extent of the lumber trade of Puget Sound can be derived from the fact that one of those mills cuts, when running on full time, 400,000 feet per day. The owners of the mill also own twenty-five vessels, and ship their lumber to all parts of the world. A town of about 1,000 souls has grown up around the mill, with store, residences, etc., all owned by the company.



THE PEACOCK.
FROM A PAINTING BY HARRISON WEIR.

ARAGO AND THE BANDITTI.



THIS celebrated French astronomer, as is well known, was in the early part of his life appointed, with two other scientific men, to complete the measurement of the arc of the meridian. This undertaking necessitated his residence for some time in the loftiest summits of the Pyrenees, and involved him in many romantic adventures and hair-

breadth escapes. The following anecdote, taken from his autobiography, will show what a perilous life was led by the delegates of the Bureau of Longitude :—

“During my stay on a mountain near Cullera, to the north of the mouth of the river Xucar, and to the south of the Albufera, I once conceived the project of establishing a station on the high mountains which are in front of it. I went to see them. The alcaid of one of the neighbouring villages warned me of the danger to which I was about to expose myself. ‘These mountains,’ said he to me, ‘form the resort of a crowd of robbers.’ I asked for the national guard, as I had the power to do so. My escort was supposed by the robbers to be an expedition directed against them, and they spread themselves at once over the rich plain which is watered by the Xucar. On my return I found them engaged in combat with the authorities of Cullera. Wounds had been given on both sides; and, if I recollect right, one alguazil was left dead on the plain.

The next morning I regained my station. The following night was a horrible one; the rain fell in a deluge. Towards night, there was knocking at my cabin door. To the question, ‘Who is there?’ the answer was, ‘A custom-house guard, who asks of you a refuge for some hours.’ My

servant having opened the door to him, I saw a magnificent man enter, armed to the teeth. He laid himself down on the earth, and went to sleep. In the morning, as I was chatting with him at the door of my cabin, his eyes became animated on seeing two persons on the slope of the mountain, the alcaid of Cullera and his principal alguazil, who were coming to pay me a visit. ‘Sir,’ cried he, ‘nothing less than the gratitude which I owe to you, on account of the service which you have rendered to me this night, could prevent my seizing this occasion for disencumbering myself, by one shot of this carbine, of my most cruel enemy. Adieu, sir!’ And he departed, springing from rock to rock as light as a gazelle.

When arrived at the cabin, the alcaid and his alguazil recognised in the fugitive the chief of all the brigands in the country.

Some days afterwards, the weather having again become very bad, I received a second visit from the pretended custom-house guard, who went soundly to sleep in my cabin. I saw that my servant, an old military man, who had heard the recital of the deeds and behaviour of this man, was preparing to kill him. I jumped down from my camp bed, and seizing my servant by the throat,—‘Are you mad?’ said I to him; ‘are we to discharge the duties of police in this country? Do you not see, moreover, that this would expose us to the resentment of all those who obey the orders of this redoubted chief? And we should thus render it impossible for us to terminate our operations.’

Next morning, when the sun rose, I had a conversation with my guest, which I will try to reproduce faithfully.

‘Your situation is perfectly known to me; I know that you are not a custom-house guard; I have learnt from certain

information that you are the chief of the robbers of the country. Tell me whether I have anything to fear from your confederates?’

‘The idea of robbing you did occur to us; but we concluded that all your funds would be in the neighbouring towns; that you would carry no money to the summit of mountains, where you would not know what to do with it, and that our expedition against you could have no fruitful result. Moreover, we cannot pretend to be as strong as the King of Spain. The king’s troops leave us quietly enough to exercise our industry; but on the day that we molested an envoy from the Emperor of the French, they would have directed against us several regiments, and we should soon have succumbed. Allow me to add, that the gratitude which I owe to you is your surest guarantee.’

‘Very well, I will trust in your words; I shall regulate my conduct by your answer. Tell me if I can travel at night? It is

fatiguing to me to move from one station to another in the day under the burning influence of the sun.’

‘You can do it, sir; I have already given my orders to this purpose; they will not be infringed.’

Some days afterwards I left for Denia; it was midnight, when some horsemen rode up to me, and addressed these words to me:—

‘Stop there, señor; times are hard: those who have something must aid those who have nothing. Give us the keys of your trunks; we will only take your superfluities.’

I had already obeyed their orders, when it came into my head to call out—

‘I had been told, however, that I could travel without risk.’

‘What is your name, sir?’

• ‘Don Francisco Arago.’

This satisfied them, and our cavaliers, spurring away from us, were rapidly lost to sight.”



MONKEY STORIES.

ANY interesting and amusing stories are recorded of the monkey tribe. The following exhibit some of their more intelligent traits of character:—

Some time ago a ship sailed for England from a port in the West Indies, the captain of which had taken four monkeys on board, and also a quantity of very fine grapes. The monkeys were allowed to wander at will around the ship; and soon after the vessel had put to sea the grapes, which the captain had hung up in his cabin, began to disappear from it in the most unaccountable manner. The monkeys were suspected, and they were watched for some time, but nothing was discovered. The bunches of grapes continuing to disappear

despite these precautions, the captain himself determined to watch, and “that he might mete out due punishment to the offenders when caught, he provided himself with a rope’s end,” and, lying down in his cabin, pretended to sleep. This was in the morning, about the time that the monkeys were let out of the cage, where they were confined for the night. The captain had just time to settle, when down came the whole troop of monkeys from the deck, halting, however, at the cabin door, as if surprised to find the cabin occupied. There they remained for some time in deep consultation, concocting their little plan of action. At length one of them mounted the table, and cautiously approaching the apparently sleeping captain, stood steadfastly regarding him for some time. He next slowly raised the captain’s eyelid to see if he really were asleep. The others

eagerly watching the result of the experiment. The whole thing so amused the captain, that he laughed loudly, whereon the whole tribe of sly pilfering rascals scampered back to the deck, filled with a wholesome dread of those consequences which would most assuredly have followed their next invasion of the cabin in search of grapes.

In one of his excursions, M. du Chaillu killed a female Nshiego carrying her young one in her arms, which he took to his residence. In a few days it was so completely tamed that he could allow it to wander at liberty, without fear of its running away. He could not move without being followed by the youngster, neither could he sit down without having the animal climbing on his knees or hiding its head in its bosom. The poor little thing found extreme pleasure in being caressed and nursed.

"If I opened my eyes," adds M. du Chaillu, "while it was in the act of committing a theft, it all at once assumed an honest air, and came to caress me; but I could readily detect it darting furtive glances towards the bananas.

On the approach of the dry season, the temperature being chilly, Tommy began to be desirous of company during his slumbers, in order to keep himself warm. The negroes did not like him for a bed-fellow, although he resembled them so much; neither did I care to give him a place near me, so that poor Tommy, repelled everywhere, found himself badly situated. But I soon discovered that he watched until everybody was asleep to creep furtively beside some negro friend, and there would sleep without stirring until daybreak, when he usually decamped before being found out. Several times he was caught in the act and beaten; but he persevered."

Buffon has given some very interesting details regarding a young Chimpanzee which was brought to Paris in 1740. He tells us that this animal offered its hand to lead people about who came to visit it; that it promenaded with them in the gravest manner, as if keeping them company; that

it sat at table; spread out its napkin; wiped its lips with it; and used its spoon and fork to carry food to its mouth; that it poured out its drink into a glass by itself; hobbled when invited to do so; that it would take a cup, and pour tea into it, leave it to cool before drinking it; and all this without any other instigation than the signs or words of its master, and often even without this.

Dr. Franklin mentions having seen, in the Zoological Gardens of Antwerp, a Chinpanzee which sometimes dined at the table of the director, where, on fête days, it drank to the health of the company in a glass of champagne. This monkey showed a great regard for the children of the house, and joined in their games. In summer it accompanied them into the garden, climbed up into a cherry-tree, and gathered fruit for them.

"I was fortunate in seeing the monkeys of Gibraltar," says Mr. Kenyon, "very soon after I arrived, for, except when the wind blows from the east, they do not often show themselves on the same side the rock as the town is situated, and are therefore not seen for long intervals. But I happened to be driving with my friends, when suddenly a little girl, who was sitting in the carriage, exclaimed with great glee, 'There are the monkeys!' and on looking, I observed, a good distance off, on the heights above us, some objects which at first I thought were dogs, but I soon perceived, from the agility with which they sprung from rock to rock, that they were indeed the animals I so much wished to see.

Gibraltar is, I believe, the only place in Europe where these monkeys are to be found, nor are they very numerous there, but they are preserved with great care, nobody being allowed to kill or catch them. They are of the species called the Barbary Ape (*Simia Inuus*), and are about three or four feet in length, of a greenish-brown colour. The face is not very unlike that of a dog, but they are extremely ugly, and have huge pouches in their cheeks, where they place their food until they want to eat it. They go about in one large troop, and seem to be

under the direction of a venerable old chief with a long white beard, who in Gibraltar is known by the name of the 'Town Major.' Usually they inhabit the highest part of the rock, and feed, I think I was told, on the palmetto plant; but sometimes, when the oranges are ripe, they come down to rob the gardens, and then they are often fierce and mischievous.

Two ladies told me that, shortly after they came to Gibraltar, they returned home one day highly indignant at the bad manners of the little boys of the town, who, they said, had been throwing stones at them from behind the trees in the Alameda. Some one suggested they must be mistaken, but no, they were quite positive of it; for they had distinctly heard the naughty little urchins laughing and whispering, although they could not see them. The next day the same thing happened, and they determined, if possible, to discover the delinquents. They ran in among the trees, and then, to their astonishment, saw several of the monkeys sitting on the branches, jabbering away and making the most hideous grimaces; so the ladies thought it best to retire at once, which they did, followed by a fresh shower of stones.

The female monkeys carry their young ones in their arms as women do their children, and Mrs. H. told me she once saw one of them performing the morning toilet of her offspring, which she described as being painfully like a similar operation among human beings; for the mother, while she smoothed down the hair of her bantling, kissed and caressed it as long as it was good, but when the thing became restless, boxed its ears soundly. It is a curious fact that the lifeless bodies or skeletons of the monkeys are never found, and it is not known what they do with their dead; some saying they throw them into the sea, and others that they carry them across to Barbary, through the subterranean passage that is supposed to exist under the straits." No one who has ever seen the monkey department of the Zoological Gardens can possibly forget the extraordinary actions

and antics—now grotesque, now ridiculous; now disgusting, and anon most touchingly affecting—of these versatile creatures, which in a few minutes he was permitted to witness. But, if thus amusing and instructive while "cribbed, cabined, and confined" within the narrow limits of a cage, how much more so may we not expect them to be when in the enjoyment of that wild liberty in which they so exuberantly delight. Mr. Parkyns, who has spent many years in the northern provinces of Egypt, describes their mischievous activity.

On entering a certain well-wooded ravine, while pursuing his peregrinations, he found the trees filled with the "tota" or "waag," a beautiful little greenish-grey monkey, with black face and white whiskers. "I followed a troop of these," he says, "for a long time, while the porters and servants were resting—not at all with the intention of hurting them, but merely for the pleasure of watching their movements. If you go tolerably carefully towards them they will allow you to approach very near, and you will be much amused with their goings-on, which differ but little from those of the large no-tailed monkeys, 'Beni Adam.' You may see them quarrelling, making love, mothers taking care of their children, combing their hair, nursing and suckling them; and the passions—jealousy, anger, love—as fully and distinctly marked as in men. They have a language as distinct to them as ours is; and their *women* are as noisy and fond of disputation as any fish-fag in Billingsgate.

The monkeys, especially the cynocephali; who are astonishingly clever fellows, have their chiefs, whom they obey implicitly, and a regular system of tactics in war, pillaging expeditions, robbing corn-fields, etc. These monkey-forays are managed with the utmost regularity and precaution. A tribe, coming down to feed from their village on the mountain (usually a cleft in the face of some cliff), brings with it all its members, male and female, old and young. Some, the elders of the tribe, distinguishable by the quantity of mane which covers their shoulders, like a lion's, take the lead, peer-

ing cautiously over each precipice before they descend, and climbing to the top of every rock or stone which may afford them a better view of the road before them. Others have their posts as scouts on the flanks or rear; and all fulfil their duties with the utmost vigilance, calling out at times, apparently to keep order among the motley pack which forms the main body, or to give notice of the approach of any real or imagined danger. Their tones of voice on these occasions are so distinctly varied, that a person much accustomed to watch their movements will at length fancy—and perhaps with some truth—that he can understand their signals.

The main body is composed of females, inexperienced males, and young people of the tribe. Those of the females who have small children carry them on their back. Unlike the dignified march of the leaders, the rabble go along in a most disorderly manner, trotting on and chattering, without taking the least heed of anything, apparently confiding in the vigilance of their scouts. Here a few of the youth linger behind to pick the berries off some trees, but not long, for the rear-guard coming up forces them to regain their places. There a matron pauses for a moment to suckle her offspring, and, not to lose time, dresses its hair while it is taking its meal. Another younger lady, probably excited by jealousy or by some sneering look or word, pulls an ugly mouth at her neighbour, and then, uttering a shrill squeal highly expressive of rage, vindictively snatches at her rival's leg or tail with her hand, and gives her perhaps a bite in the hind-quarters. This provokes a retort, and a most unladylike quarrel ensues, till a loud bark of command from one of the chiefs calls them to order. A single cry of alarm makes them all halt and remain on the *qui vive*, till another bark in a different tone reassures them, and they then proceed on their march.

Arrived at the corn-fields, the scouts take their position on the eminences all round, while the remainder of the tribe collect provision with the utmost expedition,

filling their cheek-pouches as full as they can hold; and then tucking the heads of corn under their armpits. Now, unless there be a partition of the collected spoil, how do the scouts feed?—for I have watched them several times, and never observed them to quit for a moment their post of duty till it was time for the tribe to return, or till some indication of danger induced them to take to flight. They show also the same sagacity in searching for water, discovering at once the places where it is most readily found in the sand, and then digging for it with their hands just as men would, relieving one another in the work if the quantity of sand to be removed be considerable.

Their dwellings are usually chosen in clefts of rocks, so as to protect them from the rain, and always so high that they are inaccessible to most other animals. The leopard is their worst enemy, for, being nearly as good a climber as they, he sometimes attacks them, and then there is a tremendous uproar. I remember one night, when outlying on the frontier, being disturbed in my sleep by the most awful noises I ever heard,—at least they appeared as such, exaggerated by my dreams. I started up, thinking it was an attack of the negroes, but I soon recognised the voices of my baboon friends from the mountain above. On my return home I related the fact to the natives, who told me that a leopard was probably the cause of all this panic. I am not aware how he succeeds among them. The people say that he sometimes manages to steal a young one, and make off, but that he seldom ventures to attack a full-grown ape. He would doubtless find such a one an awkward customer; for the ape's great strength and activity, and the powerful canine teeth with which he is furnished, would render him a formidable enemy, were he, from desperation, forced to stand and defend his life. It is most fortunate that their courage is only sufficiently great to induce them to act on the defensive. This indeed they only do against a man when driven to it

by fear; otherwise they generally prefer prudence to valour. Had their combativeness been proportioned to their physical powers, coming as they do in bodies of two or three hundred, it would have been impossible for the natives to go out of the village except in parties, and armed; and instead of little boys, regiments of armed men would be required to guard the cornfields.

I have, however, frequently seen them turn on dogs, and have heard of their attacking women whom they may have accidentally met alone in the roads or woods. On one occasion I was told of a woman who was so grievously maltreated by them, that, although she was succoured by the opportune arrival of some passers-by, she died a few days after from the fright and ill-treatment she had endured.

To show that their cleverness depends in some measure upon powers of reflection, and not entirely on that instinct with which all animals are endowed, and which serves them only to procure the necessaries of life and to defend themselves against their enemies, I will relate an anecdote to which I can testify as an eye-witness. At 'Khartūm, the capital of the provinces of Upper Nubia, I saw a man showing a large male and two females of this breed, who performed several clever tricks at his command. I entered into conversation with him as to their sagacity, the mode of teaching them, and various other topics relating to them. Speaking of his male monkey, he said that he was the most dexterous thief imaginable, and that every time he was exhibited he stole dates and other provisions sufficient for his food for the day. In proof of this he begged me to watch him for a few minutes. I did so, and presently the keeper led him to a spot near a date-seller who was sitting on the ground with his basket beside him. Here his master put him through his evolutions; and, although I could perceive that the monkey had an eye to the fruit, yet so completely did he disguise his intentions that no careless observer would have noticed it. He did not at first appear to care about approaching the

basket; but gradually brought, 'himself nearer and nearer, till at last he got quite close to its owner. In the middle of one of his feats he suddenly started up from the ground on which he was lying stretched like a corpse, and uttering a cry as of pain, or rage, fixed his eyes full at the face of the date-seller, and then, without moving the rest of his body, stole as many dates as he could hold in one of his hind hands. The date-man, being stared out of countenance, and his attention diverted by this extraordinary movement, knew nothing about the theft till a bystander told him of it, and then he joined heartily in the laugh that was raised against him. The monkey, having very adroitly popped the fruit into his cheek-pouches, had moved off a few yards, when a boy in the crowd round him pulled him sharply by the tail. Conscience-stricken, he fancied that it had been done in revenge by the date-seller whom he had robbed; and, so passing close by the true offender and between the legs of one or two others in the circle, he fell on the unfortunate fruiterer, and would no doubt have bitten him severely but for the interference of his master, who came to the rescue.

I have never thought it worth while to teach monkeys of my own any tricks, always preferring to watch their natural actions. I had in Abyssinia a young one of the same breed as the last mentioned. From the first day she was given to me her attachment was remarkable, and nothing would induce her to leave me at any time; in fact, her affection was sometimes ludicrously annoying. As she grew up she became more sedate, and was less afraid of being left alone. She would sit and watch whatever I did with an expression of great intelligence; and the moment I turned my back she would endeavour to imitate what I had been doing. Mr. Rodatz, master of the German brig *Alf*, coming up the country for a cargo of animals for Mauritius, gave me a copy of 'Peter Simple,' the first English book, besides the Bible and Nautical Almanac, that I had seen for more than two years. As soon as I was alone I of

course sat down and began greedily to feast on its contents, though I had read it several times before leaving England. 'Lemdy' was, as usual, seated beside me, at times looking quietly at me, occasionally catching a fly, or, jumping on my shoulder, endeavouring to pick out the blue marks tattooed there. At last I got up to light a pipe, and on my return found she had taken my seat with the book on her knee, and with a grave expression of countenance was turning over the leaves, page by page, as she had observed me to do; with the difference only that, not being able to read their contents, she turned one after the other as quickly as possible, and that, from her arms being short, and she not yet much used to books, she tore each page from the top nearly to the bottom. She had completed the destruction of half the volume before I returned. During my momentary absences she would often take up my pipe and hold it to her mouth till I came back, when she would restore it to me with the utmost politeness.

These monkeys are caught in various ways. One plan adopted by the Arabs of Tâka has struck me as the most simple, and at the same time as likely to succeed as any other. Large jars of the common country beer, sweetened with dates, and drugged with the juice of the 'ôscher' (*Asclepias arborescens*), are left near the places where they come to drink. The monkeys, pleased with the sweetness of the beverage, drink largely of it, and soon falling asleep, are taken up senseless by the Arabs, who have been watching from a distance."

• Monkeys often exhibit an almost human sagacity. Some travellers were once traversing a wild and dreary part of India, and, under the shade of an umbrageous banyan tree, sat down to their meal. The branches overhead swarmed with large black-faced monkeys. "We had just risen from our meal and were strolling forth from under the shade when one of the monkeys, a young one, fell down from a high branch at our feet. It was quite dead. The clamour that immediately arose above us was quite

deafening. The whole assembly of monkeys clustered together.' Long and loud were the chatterings, and varied the grimaces of the tribe, each individual vying with the other in the loudness of his tongue. Their looks and gestures made it apparent that they suspected us as being the cause of the death of their juvenile comrade; and had we had guns in our hands, or any other murderous weapons, we should no doubt have been maltreated. But we were unarmed, and the good sense of the monkeys seemed to tell them that there must be some other culprit. Having come to this conclusion, one monkey, apparently the senior and leader of the whole tribe, separated himself from the rest, ran to the spot on the branch whence the young monkey had fallen, examined it carefully, smelt the branch, and then glided nimbly down one of the pendant roots, with which the banyan tree is so richly furnished, and came to the corpse of the monkey, took it up, examined it minutely, particularly the shoulder, where there was a minute wound. Instinct immediately turned suspicion into certainty. He placed the corpse again on the ground, and turning his gaze in every direction endeavoured to pierce the foliage in search of the murderer. After a little while something seemed to rivet his attention, the next instant he had mounted the tree, sprung to the spot, and with one clutch had seized a long whip-snake, with which he hastened to the ground. Now occurred a most curious scene. The whole monkey rabble, following their leader in his movement, were on the ground almost as soon as he; and then, as many as could, ranged themselves on each side of the snake. Each monkey put his hand on the reptile clutching hold of the skin of the back tightly. At a given signal the executioners dragged the body of the writhing snake backward and forward on the ground till nothing was left of the murderer but the backbone. The mode of execution was at once summary and effectual, and in the way in which it was carried out was manifest the clear understanding which the monkey language conveys."



WATERWORKS AND FOUNTAINS.

THE Palace of Versailles, near Paris, was originally a small château of red brick, erected by Louis XIII. In 1660, Louis XIV. enlarged his predecessor's castle and converted it into the magnificent royal residence that it now is. This stupendous undertaking was completed in 1681 by the architect Mansard. From time to time the palace has been the scene of some of the greatest events in French history.

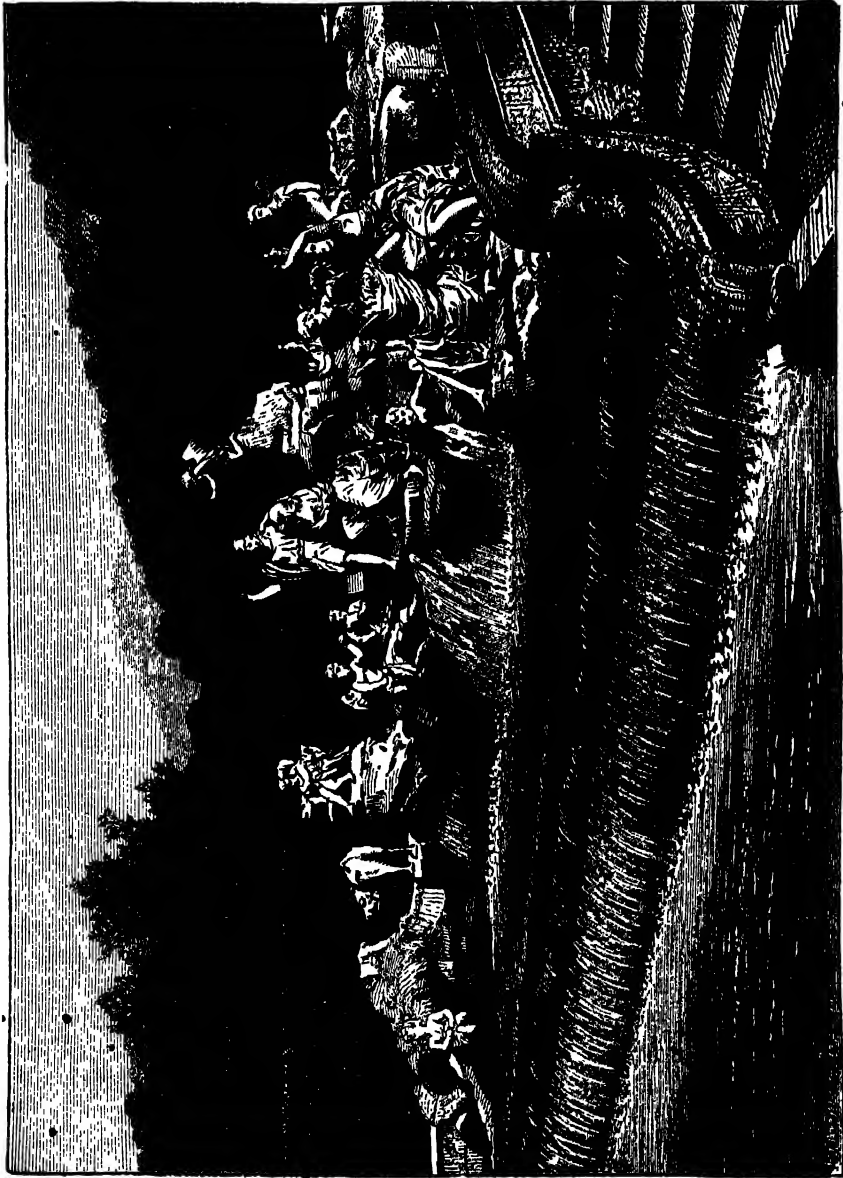
The great attraction, however, of Versailles, is its park and the wonderful waterworks, perhaps the most complete system of fountains in the world. These waterworks are divided into the *Grandes Eaux* and the *Petites Eaux*. The latter are played on the first Sunday of every month during the summer, the former only on fête days or grand festive occasions. Each of the *Grandes Eaux*, or principal waterworks, may be considered as an illustration, in a fanciful way, of some mythological or legendary history or event, the sculptor and the professor of hydraulics having united in the production of the piece. The sculptures are executed in marble and lead; they are mostly of colossal proportions, and their number is wonderful. Some of them are just beneath the surface of the water, in which they appear to dive or swim; others are half submerged and rise like monsters from the deep; and others, again, erect above the flood, rear their tall forms aloft with an imposing air. Some of the most remarkable of the watery mythologies are the following:—The *Bassin de Latone*, which presents five circular basins, one above another, bearing a group of Latona, Diana, and Apollo, on the summit. The goddess is supposed to have demanded vengeance from Jupiter upon the Libyans for refusing

her water. The vengeance is now working; the inhabitants, while undergoing the transformation into toads and frogs, are in the act of spouting water upon Latona from all sides, and it is the liquid arches which complete the picture and impart to it its peculiar effect. The *Bassin d'Appollon* is emblematical of the rising of the sun. The daygod, Apollo, is seen emerging from the flood in a chariot drawn by four splashing steeds and surrounded by horn-blowing tritons, dolphins, and sea monsters.

The *Bassin d'Encelade* represents the Giant Enceladus struggling for liberty under a mass of rocks, which he is endeavouring to hurl towards the sky; from his mouth rises a column of water to the height of fifty feet, and jets issue from his fingers and from the rocks around. The *Bains d'Appollon* represent him seated in a grotto and attended by nymphs, who bathe his feet, braid his hair, and offer him perfumes. On either side of this central group are two others, showing the Tritons in attendance upon the horses of the sun. Jets and floods of water issue from the rocks, and form a foaming lake at the foot of the god. These groups are in white marble, and are the finest in the whole garden. The grandest display of waterworks, however, is to be seen in the *Bassin de Neptune*, where the sea-god rides triumphantly on the waves, surrounded by the whole train assigned by the ancient mythology. The water, thrown aloft in high columns and descending in spray and mist, turned over in graceful arches which cross and intersect each other, or spread in thin gauze-like sheets, forms an ethereal kind of medium through which the groups of dark figures, indistinctly seen, assume an unsubstantial shape in which one half expects to see them vanish away like the old absurd and fanciful faith of which they are now nothing more than the poetical phantoms.

The cost of playing these waterworks is so great, amounting, it is said, to about ten thousand francs for each rehearsal, that their exhibition is comparatively but of rare occurrence.

The spectacle, taken in the whole, may be regarded as perfectly unique. The vast crowd in their gayest attire scattered on the terraces and sloping grounds, among the beds of flowers, the statues, the vases, the



flashing columns and waving arcs of liquid crystal, the spouting gods and grotesque flood-vomiting monsters, contrasted with the gay and ever-surg- ing multitude, the dash of many waters and the

hum of men, all together make up a scene not likely soon to escape from the memory or to relinquish its hold upon the imagination.

The celebrated fountains of the Crystal

Palace at Sydenham, as originally planned, far surpass, in the grandeur and completeness of their design any in the world, not even excepting those of Versailles. The whole system is divided into two series, the upper and the lower. The former comprise six basins in what is called the Italian Fountain, a large central basin, and two smaller ones on each side of it, in all, nine enormous fountains. Beyond and below these is the lower series, which consist of two beautiful water temples, numerous wide cascades, and many groups of separate fountains. These are known as the "Grand Fountains," and are played on special and grand occasions only.

The basins in the Italian Fountain are ornamented by bronze statues; the large centre basin is surrounded by marble copies of some of the greatest ancient and modern works of art; and the cascades are bordered by small bronze fountains—tazzas supported by Cupids. With these exceptions, the fountains are left to the effect which the number and variety of the jets, and the volume of water they deliver, is sure to produce, unaided by the adventitious assistance of architectural or plastic ornament, which forms such a large feature in the Versailles waterworks.

The highest jet of water in the fountain of the large circular basin attains the altitude of 150 feet; and around this is a series of single streams which force their spray to an almost equal height. The diameter of this basin is no less than 196 feet, and a combination of small jets, forming a kind of trellis-work of water, encircles the whole. The fountains in the Italian Gardens are equally graceful, though different in the details of their design. The highest columns rise 90 feet, and the smaller jets which surround them are proportionately high.

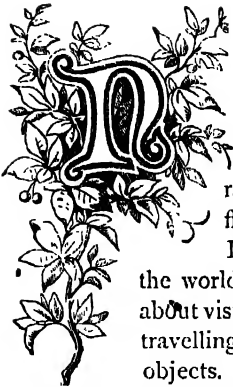
The two Grand Fountains in the lower grounds are by far the largest in the world, and impart the grandest effect to the whole series. The outline of their basins is similar in design, each being 784 feet long, with a diameter of 468 feet. The central jet in each is $2\frac{1}{2}$ inches diameter, and reaches the

extraordinary height of more than 250 feet, rather higher than the celebrated steeple of Bow Church, in Cheapside. Around each central jet is a column composed of fifty 2-inch jets. The force of water which presses on the mouth of these pipes is equivalent to 262 lb. to the square inch. When the whole are in operation, 120,000 gallons of water per minute are poured forth by 11,788 jets; and in one simple complete display, lasting a quarter of an hour, nearly 2,000,000 gallons are used.

These fountains are supplied with water from an artesian well, which has a brick shaft of $8\frac{1}{2}$ feet in diameter, and is 247 feet deep. From this depth an artesian bore descends still further for 328 feet, making the entire distance from the surface 575 feet. A supply of water being thus obtained, the next operation is to raise it from the bottom of the hill where the well is situate, to a sufficient height to play the fountains. The pressure required to force the respective jets of water to heights ranging from 5 to nearly 300 feet is obtained in the following simple manner.

Reservoirs are formed at different levels in the grounds, the highest of all being placed on a hill; the second on a level with the basin of the great Central Fountain; and a low lake forms the lowest reservoir. Two pairs of powerful engines are employed—one near the well from which the supply is obtained, and the other close to the highest reservoir. By this system, water is pumped by the lower engine to the intermediate reservoir, and thence to the upper level, whence a second raises it to two enormous tanks, erected on columns, and also to the tanks of two high towers which play the main jets of the Great Fountains. By this arrangement the water, instead of being wasted, is economised, and passing backwards and forwards from one reservoir to the other, is used again and again; the intermediate reservoirs collecting it after a display of the upper series, and the lowest lake forming a similar receptacle when a display of the Great Fountains takes place.

THE DRUIDS AND THEIR TEMPLES.



NEAR the town of Carnac, in Brittany, France, there is an extensive plain, several miles wide, with a flat and barren surface.

It is the last place in the world a tourist would care about visiting, if he were simply travelling in search of beautiful objects. In winter the coldest winds blow over it with wild force; and in summer it is unprotected by trees or shrubbery from the scorching shafts of the sun. But it is not wholly uninteresting, and a short visit to it is well worth the while of the traveller.

There are few houses or trees on the plain; but, it is divided into several avenues by long rows of unhewn upright stones, which, as far as the eye can see, are arranged in almost perfect order, like an army prepared for battle. There are over a thousand of them, and they stretch across the country, from east to west, for nearly seven miles. The largest are twenty two feet high; and the smallest ten feet. A few have fallen, and others have been carted away; but originally they were placed at regular distances apart.

When you come nearer to them, you will see many signs of age upon them. They are scamed, mossy, and battered. How old do you guess they are? Nobody is quite sure, not even the wisest of the historians; but we may safely say that they have held their present positions for over 1,800 years.

For 1,800 years they have clung to the meagre ground, and withstood the combined assaults of time and storms, while generations of the living have passed away. How did

they come there? The credulous people, to whom all fairy stories were the truest histories, believed that giants brought them and planted them; but we know better than that. They were erected by ordinary men, and we can scarcely imagine how much labour the work cost at a time when there were no railways or massive cranes. Years, perhaps centuries, were occupied, and to the builders the undertaking must have seemed as stupendous as the erection of the Menai Bridge seems to us.

Similar stones are found at other places in Brittany; but the most famous collection is on a plain near the town of Salisbury. This is called Stonehenge, and consists of 140 stones, the smallest of which weigh ten tons and the largest seventy tons. The remains of men and animals have been also found in the vicinity, and these have given the antiquaries a clue as to the objects for which the stones were raised.

Nothing positive is known about them, but it is supposed that they mark the temples of the Druids, a religious order which possessed great power in France and England during the century before and the century after the coming of Christ. Human sacrifices formed one of the most terrible features of their religion. The victims usually were criminals or prisoners of war; but when there were none of these, innocent and unoffending persons were sacrificed.

The favourite resort of the Druids was an island opposite the mouth of the River Loire, in France, where, once every year, between sunrise and sunset, they pulled down and rebuilt the roof of their temples, and any priest who allowed the smallest part of the sacred materials to fall carelessly, was torn in pieces by his fellows.

THE LEAK IN THE DYKE.

A STORY OF HOLLAND.



THE good dame looked from
her cottage
At the close of the pleasant day,
And cheerily called to her
little son
Outside the door at play :
"Come, Peter, come ! I
want you to go,
While there is light to see,
To the hut of the blind old
man who lives

Across the dyke, for me ;
And take these cakes I made for him—
They are hot and smoking yet ;
You have time enough to go and come
Before the sun is set."

Then the good wife turned to her labour,
Humming a simple song,
And thought of her husband, working hard
At the sluices all day long ;
And set the turf a-blazing,
And brought the coarse, black bread ;
That he might find a fire at night,
And see the table spread.

And Peter left the brother,
With whom all day he had played,
And the sister who had watched their sports
In the willow's tender shade
And told them they'd see him back before
They saw a star in sight,
Though he wouldn't be afraid to go
In the very darkest night !
For he was a brave, bright fellow,
With eye and conscience clear ;
He could do whatever a boy might do,
And he had not learned to fear.
Why, he wouldn't have robbed a bird's nest,
Nor brought a stork to harm,
Though never a law in Holland
Had stood to stay his arm !

And now, with his face all glowing,
And eyes as bright as the day
With the thoughts of his pleasant errand,
He trudged along the way ;
And soon his joyous prattle
Made glad a lonesome place—
Alas ! if only the blind old man
Could have seen that happy face !
Yet he somehow caught the brightness
Which his voice and presence lent ;
And he felt the sunshine come and go
As Peter came and went.

And now, as the day was sinking,
And the winds began to rise,
The mother looked from her door again,
Shading her anxious eyes,
And saw the shadows deepen,
And birds to their homes come back,
But never a sign of Peter
Along the level track.
But she said : "He will come at morning,
So I need not fret or grieve—
Though it isn't like my boy at all
To stay without my leave."

But where was the child delaying ?
On the homeward way was he,
And across the dyke while the sun was up
An hour above the sea.
He was stooping now to gather flowers,
Now listening to the sound,
As the angry waters dashed themselves
Against their narrow bound.
"Ah ! well for us," said Peter,
"That the gates are good and strong,
And my father tends them carefully,
Or they would not hold you long !
You're a wicked stea," said Peter ;
"I know why you fret and chafe ;
You would like to spoil our lands and
homes ;
But our sluices keep you safe !"

But hark ! Through the noise of waters
 Comes a low, clear, trickling sound :
 And the child's face pales with terror,
 As his blossoms drop to the ground.
 He is up the bank in a moment,
 And, stealing through the sand,
 He sees a stream not yet so large
 As his slender, childish hand.
'Tis a leak in the dyke ! He is but a boy,
 Unused to fearful scenes:
 But, young as he is, he has learned to know
 The dreadful thing that means !
A leak in the dyke ! The stoutest heart
 Grows faint that cry to hear,
 And the bravest man in all the land
 Turns white with mortal fear,
 For he knows the smallest leak may grow
 To a flood in a single night ;
 And he knows the strength of the cruel sea
 When loosed in its angry might.
 And the boy ! He has seen the danger,
 And, shouting a wild alarm,
 He forces back the weight of the sea
 With the strength of his single arm !
 He listens for the joyful sound
 Of a footstep passing nigh :
 And lays his ear to the ground, to catch
 The answer to his cry.
 And he hears the rough winds blowing,
 And the waters rise and fall,
 But never an answer comes to him,
 Save the echo of his call.
 He sees no hope, no succour,
 His feeble voice is lost ;
 Yet what shall he do but watch and wait,
 Though he perish at his post !
 So, faintly calling and crying
 Till the sun is under the sea ;
 Crying and moaning till the stars
 Come out for company ;
 He thinks of his brother and sister,
 Asleep in their safe warm bed ;
 He thinks of dear father and mother,
 Of himself as dying—and dead ;
 And of how, when the night is over,
 They must come and find him at last :

But he never thinks he can leave the place
 Where duty holds him fast.

The good dame in the cottage
 Is up and astir with the light,
 For the thought of her little Peter
 Has been with her all the night.
 And now she watches the pathway,
 As yester-even she had done ;
 But what does she see so strange and black
 Against the rising sun ?
 Her neighbours are bearing between them,
 Something straight to her door ;
 Her child is coming home, but not
 As he ever came before !

" He is dead !" she cries ; " my darling !"
 And the startled father hears,
 And comes and looks the way she looks,
 And fears the thing she fears :
 Till a glad shout from the bearers
 Thrills the stricken man and wife—
 " Give thanks, for your son has saved our
 land,
 And God has saved his life !"
 So, there in the morning sunshine
 They knelt about the boy :
 And every head was bared and bent
 In tearful, reverent joy.

'Tis many a year since then ; but still,
 When the sea roars like a flood,
 Their boys are taught what a boy can do,
 Who is brave and true and good.
 For every man in that country
 Takes his dear son by the hand,
 And tells him of little Peter,
 Whose courage saved the land.

They have many a valiant hero,
 Remembered through the years ;
 But never one whose name so oft
 Is named with loving tears.
 And his deed shall be sung by the cradle,
 And told to the child on the knee,
 So long as the dykes of Holland
 Divide the land from the sea !

Alice Cary.

THE DWARFS OF CENTRAL AFRICA.

DISTANT regions are always mysterious ones, and, as Paul du Chaillu believed this, it is no wonder that in August, 1863, he sailed away in the little schooner *Mentor* from St. Katherine's Docks on a five years' expedition into the interior of Africa. His aim was to cut across the continent, and to discover the source of the Nile. His preparations were of the most complete and exhaustive character. In October he landed; and after waiting some time, he made preparations for his journey into the interior in company with twenty-five Comimien and an old trusty chief or king, who promised to put him safely under the hands of Olenda, the Ashua king, and to tell him to send our traveller on.

It is not necessary for our present purpose that the journey should be described at length. There were many difficulties in the way—rivers to be passed, mountains to be climbed, forests to be penetrated, gorillas to be encountered; but the worst of all was the plague, which at that time ravaged the country and carried off the natives like sheep. There seemed no end to it, and amongst those who suffered most were Du Chaillu's friends. Of course, in their ignorance, the people considered that it was he who had brought it amongst them, and the farther the traveller penetrated into the interior the more obstinately was this theory held, the greater was the terror of his name, and the more insuperable were the objections they made to his coming in their midst. It is no use arguing with people when they are smitten with a panic, and so Du Chaillu found it. In vain alike were his appeals, his arguments, and his bribes. It was with a sorrowful heart he left Ashua land. The king had died, the plague had destroyed the people, and the survivors

accused him of having been the cause of all the mischief. Even those who did not go so far as this credited him with being in possession of the evil eye, and shunned him accordingly.

At last came the end in the country of the Ashangos. One of Du Chaillu's men in firing a gun unfortunately shot an Ashango man, and to make matters worse the unfortunate bullet entered a tent and slew the queen's sister, and it was all up with poor Du Chaillu. Further exploration was quite out of the question. How to get back safe and sound to the coast with an infuriated population on each side of him was the question to be solved. As it was he did little more than get a glimpse of a 'dwarf village. Let us quote his particulars respecting them:—

"Early the next morning we started again on our journey through the great forest, passing many hills and several rivulets with queer names. Suddenly we came upon twelve strange little houses scattered at random, and I stopped and asked Kombila for what use these shelters were built. He answered, 'Spirit, these are the houses of a small people called Obongoes.'

'What?' said I, thinking I had not understood him.

'Yes,' repeated Kombila; 'the people who live in such a shelter can talk, and they build fires.'

'Kombila,' I replied, 'why do you tell me a story? How can people live in such little places? These little houses have been built for idols. Look,' said I, 'at those little doors; even a child must crawl on the ground to get into them.'

'No,' said Kombila; 'the dwarfs have built them.'

'How can that be?' I asked, 'for where are the dwarfs now? There are no plantain trees around, there are no fires, no cooking pots, no water jugs.'

'Oh!' said Kombila, 'these Obongoes

are strange people. They never stay long in the same place. They cook on charcoal. They drink with their hands or on large leaves.'

'Then,' I answered, 'do you mean to say that we are in the country of the dwarfs?'

'Yes,' said Kombila; 'we are in the country of the dwarfs. They are scattered in the forest. Their little villages, like the one you see before you, are far apart. They are as wild as the antelope, and roam in the forest from place to place. They are like the beasts of the field. They feed on serpents, rats, and mice, and on the leaves and nuts of the forests.'

'That cannot be,' I said.

'Yes, Oguizi, this is so,' replied the porter. 'Look for yourself;' and they proceeded to the huts.

Is it possible, I asked myself, that there are people so small that they can live in such small buildings as those before me?

How strange the houses of the dwarfs seemed! The length of each house was about that of a man, and the height was just enough to keep the head of a man from touching the roof when he was seated. The materials used in building were the branches of trees bent in the form of a bow, the ends put into the ground and the middle branches being the highest. The shape of each house was very much like that of an orange cut in two. The framework was covered with large leaves, and there were little doors, which did not seem to be more than eighteen inches high, and about twelve or fifteen inches broad. Even the dwarfs must have lain almost flat on the floor in order to pass through. When I say door I mean simply an opening, a hole to get through. It was only a tiny doorway. But I managed to get inside one of these strange little houses, and I found there two beds, which were as curious as everything else about the premises. Three or four sticks on each side of the hut were the beds. Each bed was about eight inches, or at the most ten inches in breadth. One was for the wife, and the other for the husband. A

little piece of wood on each bed makes the pillows. It was almost pitch dark inside, the only light coming from the opening or door. Between the two beds were the remains of a fire, judging by the ashes and the pieces of burnt wood."

These huts did really look like the habitations of men, the homes of a race of dwarfs. After this Du Chaillu describes his visit to a dwarf village.

"After leaving Niembouani we walked through the forest in the most cautious manner, and as we approached the settlement, an Ashango man, who was in the lead, turned his head to usward, put his finger on his lips for us to be silent, and made a sign for us to walk very carefully, and we advanced with more circumspection than ever. After awhile we came to the settlement of dwarfs. Over a small area the undergrowth had been partially cut away, and there stood twelve queer little houses which were the habitation of these strange people, but not a dwarf was to be seen. 'They had all gone. 'Nobody here?' shouted the Ashangos, and the echo of their voices alone disturbed the stillness of the forest. I looked around at the strange settlement of living dwarfs. There was no mistake about it. The fires were lighted, the smoke ascended from the interior of their little shelters, on a bed of charcoal embers there was a piece of snake roasting, before another were two rats cooking, on the ground there were several baskets of nuts, and one of leaves, with some large wild fruits that had been gathered by the dwarfs in the woods, while near by stood several calabashes filled with water and some bundles of dried fish.

There was indeed no mistake. The huts I had seen on the way to Niembouani were the same as these, and had been made surely by the same race of dwarfs. The Ishogos had told me no idle stories. I wish you could have seen the faces of Rebouka, Igalo, and Macoudia. 'Oh, oh, oh,' they exclaimed. 'Chally, what are we not going to see in the wild country you bring us to!' I lingered a long while, in the hope that the dwarfs would return, but they

did not. We called for them, but our voices were lost. We followed some of their tracks, but it was of no use. 'You cannot overtake them,' said the Ashangos, 'for they can run through the jungle as fast as the gazelle, and as silently as a snake, and they are far off now. They are afraid of you.' Before leaving the settlement I hung on the lower branches of trees surrounding the village strings of beads of bright colours."

Not disheartened by his failure, Du Chaillu again renews his attempt. This time with more success. He actually enters the village, and thus describes his capture of the dwarfs.

"We continued to walk very carefully, and after awhile we came near another settlement of the dwarfs, which was situated in the densest part of the forest. I see the huts. We cross the little stream from which the dwarfs drew their water to drink. How careful we are as we walk towards their habitations, our bodies bent almost double in order not to be easily discovered! I am excited; oh, I would give so much to see the dwarfs, to speak to them. How craftily we advance, how cautious, for fear of alarming the shy inmates! My Ashango guides hold bunches of beads. I see that the beads we had hung on the trees had been taken away.

All our caution was in vain. The dwarfs saw us, and ran away in the woods. We rushed, but it was too late, they had gone. But as we came into the settlement I thought I saw three creatures lying flat on the ground and crawling through their small doors into their houses. When we were in the very midst of the settlement I shouted, 'Is there anybody here?' No answer. The Ashangos shouted, 'Is there anybody here?' I said to the Ashangos, 'I am certain that I have seen some of the dwarfs go into their huts.' Then they shouted again, 'Is there anybody here?' The same silence. Turning towards me, my guides said, 'Oguizi, your eyes have deceived you; there is no one here. They have all fled. They are afraid of you.' 'I am not mistaken,' I answered. I went with

one of the Ashangos towards one of the huts where I thought I had seen one of the dwarfs go inside to hide, and as I came to the little door I shouted again, 'Is there anybody here?' No answer. 'I told you, Oguizi, that they have all run away.' It did seem queer to me that I had suffered an optical illusion. I was perfectly sure that I had seen three dwarfs get inside of their huts. 'Perhaps they have broken through the back part and have escaped,' said I. So I walked round their little houses, but everything was right; nothing had gone outside through the walls.

In order to make sure I again came to the door and shouted, 'Nobody here?' The same silence. I lay flat on the ground, put my head inside the door, and again shouted, 'Nobody here?' It was so dark inside that coming from the light I could not see. So I extended my arm in order to feel if any one was within. Sweeping my arm from left to right, at first I touched an empty bed composed of three sticks. Then feeling carefully, I moved my arm gradually towards the right, when—hallo!—what do I feel? A leg, which I immediately grabbed above the ankle, and a piercing shriek startled me. It was the leg of a human being, and that human being a dwarf! I had got hold of a dwarf!

'Don't be afraid; the Spirit will do you no harm,' said my Ashango guide.

'Don't be afraid,' I said in the Ashango language; and immediately I pulled the creature I had secured by the leg through the door in the midst of great excitement amongst my Commi men.

'A dwarf,' I shouted as the little creature came out. 'A woman,' I shouted again. 'A pigmy.' The little creature shrieked, looking at me. 'Nehende! nehende! nehende!' said she; and her piercing wail rent the air.

What a sight! I had never seen the like. 'What!' said I; 'now I do see the dwarfs of equatorial Africa; the dwarfs of Homer, Herodotus; the dwarfs of the ancients.'

How queer the little old woman looked!

How frightened she was. She trembled all over. She was neither white nor black. She was of a yellow or mulatto colour. 'What a little head; what a little body; what a little hand; what a little foot!' I exclaimed. 'Oh, what queer-looking hair!' said I bewildered. The hair grew on the head in little tufts apart from each other, and the face was as wrinkled as a baked apple. I cannot tell you how delighted I was at my discovery.

So giving my little prize to one of the Ashangos, and ordering my Commi men to catch her if she tried to run away, I went to the other little dwelling, where I thought I had seen another of the dwarfs hide himself. The two little huts stood close together. I shouted, 'Nobody here?' No answer. Getting my head inside the hut through the door, I again shouted, 'Nobody here?' No answer. I moved my right hand to see if I could feel anybody, when, lo! I seized a leg, and immediately heard a shriek. I pulled another strange little dwarf out of the door. It was also a woman, not quite as old as the first, but having exactly the same appearance.

The two dwarf women looked at each other, and began to cry and sing mournful songs, as if they expected to be killed. I said to them, 'Be not frightened.'

Then the Ashangos called to the last dwarf who had tried to come out, that it was no use, I had seen them all. They had hardly spoken when I saw a little head popping out of the door, and my Ashangos made the creature come out. It was a woman also, who began crying, and the trio shrieked and cried, and cried and shrieked, wringing their hands, till they got tired. They thought their last day had come.

'Don't be afraid,' said the Ashangos; 'the Oguizi is a good Oguizi.' 'Don't be afraid,' said my Commi men. After a while they stopped crying, and began to look at me more quietly.

For the first time I was able to look quietly at these little dwarfs. They had prominent cheek-bones, and were yellow, their faces being exactly of the same colour

as the chimpanzee; the palms of their hands were almost as white as those of white people; they seemed well proportioned, but their eyes had an untamable whiteness that struck me at once; they had thick lips and flat noses like the negroes, their foreheads were low and narrow, and their cheek-bones prominent, and their hair, which grew in little short tufts, was black, with a reddish tinge.

After a while I thought I heard a rustling in one of the houses. So I went there, and found it inside filled with the tiniest children. They were exceedingly shy. When they saw me they hid their heads, just as young dogs or kittens would do, and got into a huddle and kept still. These were the little dwarfish children, who had remained in the village under the care of the three women while the dwarfs had gone into the forest to collect their evening meal; that is to say, nuts, fruits, and leaves, and to see if the traps they had set had caught any game.

I immediately put beads around the necks of the women, gave them a leg of wild boar and some plantains, and told them to tell their people to remain and not be afraid. I gave some meat to the little children, who as soon as I showed it to them seized it just in the same manner that Fighting or Ugly Tom would have done, only instead of fighting, they ran away immediately. Very queer specimens these little children looked to be. They were, if anything, lighter in colour than the older people, and they were such little bits of things that they reminded me, I could not help it, of the chimpanzees and nshiego mbouvés I had captured at different times, though their heads were much larger.

I waited in vain. The inhabitants did not come back. I told the women that the next day I should return and bring them meat (for they are said to be very fond of it) and plenty of beads."

As Du Chaillu made friends of the people, it is a pity he did not bring a few away with him. Certainly it would have been a little more satisfactory to that large class

with whom seeing is believing, and to that class, almost equally numerous, who, are of an exceedingly sceptical turn of mind. To many the solution of this dwarf problem would have been quite as interesting as the discovery of the sources of the Nile.

"If you want one of these to take away with you," said the Ashango guide, "we will capture one for you, if you will give us beads and copper rings."

"No, no," was his reply; "the Spirit does not want to capture people. He wants only to see people."

He was, according to his own account, quite at home with the dwarfs, and during his stay quite mastered all their manners and customs.

One day, he tells us, he went hunting in order to kill meat and give it to the dwarfs, and "their delight was great when I brought back five monkeys. A little while after I had put the monkeys on the ground, I said, 'Dwarfs, let us be good friends. Don't you see that I have no desire to kill you or capture you? I wish only to know you well.

Every time I come to see you I bring you food and nice things; that is so sweet, eh?' The hours passed away, and as evening approached I said, 'Dwarfs, what do you say to my spending the night in your settlement?'" The proposal was accepted with immense applause. "The little dwarfs," he writes, "went into the woods to collect there firewood for me, and to look after the traps. After awhile they came back, and they too brought food. Misesund brought me a basket of wild berries, and the other Obongoes presented me with game consisting of three beautiful fat rats, a nice little mouse, one squirrel, two fish, and a piece of snake. They laid these things before me. To please them I ordered the squirrel to be cooked on a bright charcoal fire, and how delighted they were to see me eat it! How they shouted as they saw me take mouthful after mouthful!"

And then, when on the morrow Du Chaillu bade them good-bye, they said to him, "Be kind to other dwarfs, as you have been to us."

THE AMERICAN KING OF BEASTS.

THE JAGUAR.



THE jaguar has been called the American "king of beasts;" and his title to that rank is less doubtful than that of his Old-

World relation, the lion, whose claim to superior strength, swiftness, and sagacity is not only disputed by the elephant,

but by the gorilla, the orang-outang and the rhinoceros, and above all by the Bengal tiger, who is his match in strength and more than his match in swiftness and cunning. The grizzly bear of the Rocky Mountains surpasses him in weight, and perhaps in the bone-crunching power of

his jaws, but these advantages are more than offset by the greater agility and general vigour of the tropical giant-cat. Governor Pacheco, of California, lassoed an old grizzly in the Contra Costa Mountains a few years ago, and dragged him home to his mother's ranch; and the same feat has been repeatedly performed by other sportsmen of his native state; but, to use the words of an old Mexican hunter of my acquaintance, "You might as well try to lariat Old Scratch himself as an old jaguar."

In the summer of 1866 a French gunboat, *La Belle Rhone*, landed ammunition and supplies for the Maximilian Government in the harbour of Sisal, and before leaving the harbour took a fine jaguar on board that had been purchased by an agent

of the new Zoological Gardens of Marseilles. The brute had been captured in a pitfall in the neighbourhood of Merida, and, being a full-grown and beautiful specimen, was preferred to different tame ones which the citizens of the town offered for sale, though his ferocity made it necessary to confine him in a cage of *charca* sticks, a species of wood that does not easily break, but splinters like bamboo, and resists the attempts of any animal to gnaw it by lacerating its gums. When the cage was brought on board, the captive seemed to know that his remaining chances of escape were numbered by minutes, and braced himself for a last effort. In the moment when his moveable prison was being lowered through the hatchway he forced his paw through the staves, reached out, and tore the shoulder of the nearest sailor with a succession of ripping blows. The man jumped aside, yelling murder, his mates slipped their grip, and the cage, jaguar and all, tumbled down fifteen feet, straight into the hold, and upon a pile of pig-iron ballast which fractured its bottom board. The men stood aghast, and the shrieks and the rush of stampeding labourers below confirmed their worst fears: the jaguar was running at large in the hold of the ship!

Ignorant of the ladder and stairway conveniences, the brute attempted to regain the *superas auras* of the deck by the same road he had come down, and after jumping from rafter to rafter reached the luminous gate of the upper world by a desperate leap; and in the nick of time, for the sailors on deck had recovered their wits, and were dragging a trap-door toward the dangerous hole. They were letting it down when its edge on one side came in contact with some obstacle; a paw was pushed through

from below, a frightful head quickly after, and, heedless of the belloyed protests of the first mate, two of the men broke and ran. They returned, the one with a hand-spike, the other with a heavy bucket, but the delay had been fatal: the brute had got its second paw through, and, in spite of a shower of blows, enlarged the opening sufficiently to free the rest of his body. A *sauve qui peut* followed, and the tiger jumped on deck and stood there for a second, glaring around with bloodshot eyes. But only for a second: fully conscious, it seemed that there was not another moment to lose, he used the trap-door as a jumping board, and cleared the gunwales with a flying leap.

The boat had got under weigh some time ago, but had followed an alongshore course, so that the distance to terra firma was not very considerable—a mile, or a mile-and-a-half at the farthest. But Don Tigron was by no means out of trouble yet: rifle-balls, carbine-balls, and pistol-balls made the water fly around his head, and the marines were just coming up with their muskets, when the French lieutenant interfered: "Cessez-ça, mes Cosaques! A chap that could beat us fair and square on our own deck ought not to be shot in the water like a cowardly deserter; give him a chance."

The chance was poor enough, anyhow, for the Bay of Sisal at that time swarmed with sharks and spear-fish; but fortune favours the brave, and to his intense disgust the man with the torn shoulder saw the brute land on the opposite shore, shake himself, and disappear in the willow thicket. Before night he was probably back to his old haunts in the Lagotasso, a wiser if not a better jaguar.



SECRETS OF THE ATLANTIC CABLE.



BELIEVE that the youngsters in our family (says a writer in *St. Nicholas*) consider, my study a very pleasant room.

There are some books, pictures, and hunting implements in it, and I have quite a large number of curious things stored in little mahogany cabinets, including a variety of specimens of natural history and articles of savage warfare, which have been given to me by sailors and travellers. In one of these cabinets there are the silver wings of a flying-fish, the poisoned arrows of South Sea cannibals, sharks' and alligators' teeth, fragments of well-remembered wrecks, and an inch or two of thick tarred rope.

The latter appears to be a common and useless object at the first glance, but when examined closely it is not so uninteresting. It measures one and one-eighth of an inch in diameter, and running through the centre are seven bright copper wires, surrounded by a hard, dark brown substance, the nature of which you do not immediately recognise. It is gutta-percha, the wonderful vegetable juice, which is as firm as a rock while it is cold, and as soft as dough when it is exposed to heat. This is inclosed within several strands of Manilla hemp, with ten iron wires woven among them. The hemp is saturated with tar to resist water, and the wires are galvanized to prevent rust. You may judge, then, how strong and durable the rope is, but I am not sure that you can guess its use.

Near the southern extremity of the western coast of Ireland there is a little harbour called Valentia, as you will see by referring to a map. It faces the Atlantic Ocean, and the nearest point on the opposite shore is a sheltered bay prettily named Heart's Content, in Newfoundland. The waters

between are the stormiest in the world, wrathful with hurricanes and cyclones, and seldom smooth even in the calm months of midsummer. The distance across is nearly two thousand miles, and the depth gradually increases to a maximum of three miles. Between these two points of land—Valentia in Ireland and Heart's Content in Newfoundland—a magical rope is laid, binding America to Europe with a firm bond, and enabling people in London to send instantaneous messages to those in New York. It is the first successful Atlantic cable, and my piece was cut from it before it was laid.

Copper is one of the best conductors of electricity known, and hence the wires in the centre are made of that metal. Water, too, is an excellent conductor, and if the wires were not closely protected, the electricity would pass from them into the sea, instead of carrying its message the whole length of the line. Therefore, the wires must be incased or insulated in some material that will not admit water and is not itself a conductor. Gutta-percha meets these needs, and the hemp and galvanized wire are added for the strength and protection they afford to the whole.

It was an American who first thought of laying such an electric cable as this under the turbulent Atlantic. Some foolish people laughed at the idea and declared it to be impracticable. How could a slender cord, two thousand miles long, be lowered from an unsteady vessel to the bottom of the ocean without break? It would part under the strain put upon it, and it would be attacked by marine monsters, twisted and broken by the currents. At one point the bed of the sea suddenly sinks from a depth of two hundred and ten fathoms to a depth of two thousand and fifty fathoms. Here the strain on the cable, as it passed over the ship's stern would be so great that it certainly must break. More than this, the slightest flaw—a hole smaller

than a pin's head—in the gutta-percha insulator would spoil the entire work, and no remedy would be possible. A great many people spoke in this way when the Atlantic cable was first thought of, as others, years before, had spoken of Watt and Stephenson. But Watt invented the steam-engine, Stephenson invented the locomotive, and Cyrus Field bound Great Britain to the United States by telegraph.

Early in 1854 Mr. Field's attention was drawn to the scheme for a telegraph between Nova Scotia and Newfoundland, in connection with a line of fast steamships from Ireland to call at St. John's, Newfoundland. The idea struck him that if a line were laid to Ireland, lasting benefit would result to the world. So he called together some of his intimate friends, including Peter Cooper, Moses Taylor, Chandler White, and Marshall O. Roberts, and they joined him in organizing the "New York, Newfoundland, and London Telegraph Company," which was the pioneer in the movement to connect the two continents by a telegraph cable, and without whose aid its consummation would have been indefinitely delayed.

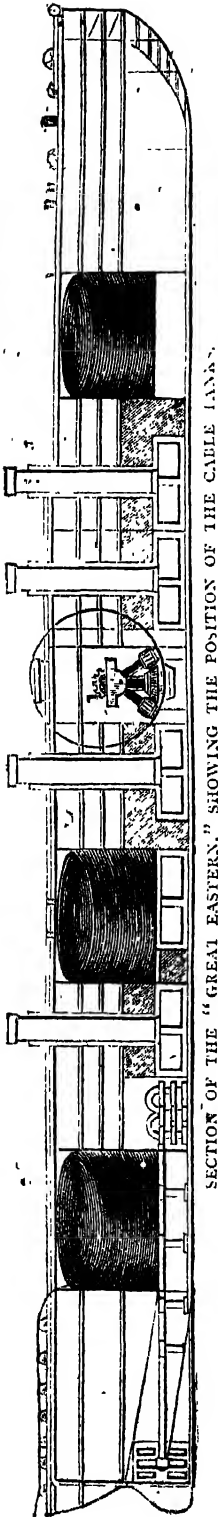
The work was costly and difficult. The first part consisted in surveying the bottom of the sea for a route. This was done by taking "soundings" and "dredgings." As some of you are aware, "sounding" is an operation for ascertaining the depth of the sea, while "dredging" reveals what plants and living creatures are at the bottom. After much patient labour a level space was found between Ireland and Newfoundland, and it seemed to be so well adapted to the surveyor's purposes that it was called the "Telegraphic Plateau."

Two or three large vessels were next equipped, and sent out with several thousand miles of cable on board, which they proceeded to lay. But the fragile cord—fragile compared with the boisterous power of the waves—broke in twain, and could not be recovered. A second attempt was made, and that failed too. Brave men can overcome adversity, however, and the little

band of scientific men and capitalists were brave men and were determined to succeed. Each heart suffered the acute anguish of long-deferred hope, and each expedition cost many hundred thousands of dollars. Nevertheless, the promoters of the Atlantic cable sent out a third time, and when failure met them again, it seemed to common minds that their scheme was a settled impossibility. Not so with the heroes. Each failure showed them some faults in their plans or machinery. These they amended. Thus, while they were left at a distance from the object of their ambition, they were brought a little nearer to its attainment.

Guided by the light of past experience, they equipped a fourth expedition. The *Great Eastern* was selected, and her interior was altered for the purpose. She was, and is still, the largest vessel afloat. Her length is six hundred and ninety-five feet; her breadth eighty-five feet, and her burthen twenty-two thousand tons. One of the principal causes of failure in previous expeditions was the inability of the cable to endure the severe strain put upon it in stormy weather as it passed from an ordinarily unsteady vessel into the sea. The *Great Eastern*, from her immense size, promised to be steady in the worst of gales. Her hold was fitted with three enormous iron tanks—a "fore" tank, a "main" tank, and an "after" tank. The main tank was the largest, and eight hundred and sixty-four miles of cable were coiled in it. Eight hundred and thirty-nine miles in addition were coiled in the after tank, and six hundred and seventy miles in the fore tank, making in all two thousand three hundred and seventy-four miles of cable. The food taken on board for the long voyage in prospect consisted of twenty thousand pounds of butcher meat, five hundred head of poultry, one hundred and fourteen live sheep, eight bullocks, a milch cow, and eighty tons of ice.

What is called the shore end of the cable—i.e., that part nearest the shore, which is thicker than the rest—was first laid



by a smaller steamer. It extended from Valentia to a point twenty-eight miles at sea. Here it was buoyed until the great ship arrived. On a wet day in July, 1866, it was joined with the main cable on board the *Great Eastern*, and on the same day that vessel started on her voyage to Newfoundland.

It may seem a simple matter to distribute or "pay out" the cable, but in practice it is exceedingly difficult. Twenty men are stationed in the tank from which it is issuing, each dressed in a canvas suit, without pockets, and in boots without nails. Their duty is to ease each coil as it passes out of the tank, and to give notice of the marks painted on the cable one mile apart. Near the entrance of the tank it runs over a grooved wheel and along an iron trough until it reaches that part of the deck where the "paying out" machine is placed. The latter consists of six grooved wheels, each provided with a smaller wheel, called a "jockey," placed against the upper

side of the groove so as to press against the cable as it goes through, and retard or help its progress. These six wheels and their jockeys are themselves controlled by brakes, and after it has been embraced by them the cable winds round a "drum" four times. The drum is another wheel four feet in diameter and nine inches deep, which is also controlled by powerful brakes; and from it the cable passes over another grooved wheel before it gets to the "dynamometer" wheel. The dynamometer is an instrument which shows the exact degree of the strain on the cable, and the wheel attached to it rises and falls as the strain is greater or less. Thence the cable is sent over another deeply grooved wheel into the sea.

You will remember what I said about insulation,—how a tiny hole in the gutta-percha would allow the electricity to escape. On deck there is a small house, which is filled with delicate scientific instruments. As the cable is paid out, it is tested here. If a wire or a nail or a smaller thing is driven through it, and the insulation is spoiled, an instrument called the galvanometer instantly records the fact, and warning is given at all parts of the ship. The man in charge touches a small handle, and an electric bell rings violently in the tank and at the paying-out machinery. At the same time a loud gong is struck, at the sound of which the engines are stopped. Delay might cause much trouble or total failure, as the injured section must be arrested and repaired before it enters the water.

The great steamer went ahead at the rate of five nautical miles an hour, and the cable passed smoothly overboard. Messages were sent to England and answers received. The weather was bright, and all hands were cheerful. On the third day after the "splicing" of the shore-end with the main cable, that part of the ocean was reached where the water suddenly increases in depth from two hundred and ten fathoms to two thousand and fifty. One of the earlier cables broke at this place and was

lost for ever. The electricians and engineers watched for it with anxious eyes. It was reached and passed. The black cord still travelled through the wheels unbroken, and the test applied by the galvanometer proved the insulation to be perfect. The days wore away without mishap until the evening of July 17, when the sound of the gong filled all hearts with a sickening fear.

The rain was falling in torrents and pattering on the heavy oil-skin clothing of the watchers. The wind blew in chilly gusts, and the sea broke in white crests of foam. A dense and pitchy cloud issued from the smoke-stacks. The vessel advanced in utter darkness. A few lights were moving about, and shadows fell hither and thither as one of the hands carried a lantern along the sloppy deck. The testing-room was occupied by an electrician, who was quietly working with his magical instrument, and the cable could be heard winding over the wheels astern, as the tinkling of a little bell on the "drum" recorded its progress.

The electrician rose from his seat suddenly, and struck the alarm. The next instant each person on board knew that an accident had happened. The engines were stopped and reversed within two minutes. Blue lights were burned off the paddle-boxes, and showed a knot in the cable as it lay in the trough.

Two remedies seemed possible. One was to cut the cable, and support one end in the water by a buoy until the rest could be unravelled. The other was to unravel the cable without cutting it.

It is a very intricate knot that an old sailor cannot untie, and the old sailors on the *Great Eastern* twisted and untwisted coil after coil until they succeeded

in untying this one. The insulation remained perfect, and in a few hours all was right again. The accident caused much ill foreboding, however, as it showed how slight an occurrence might bring the expedition to a disastrous end.

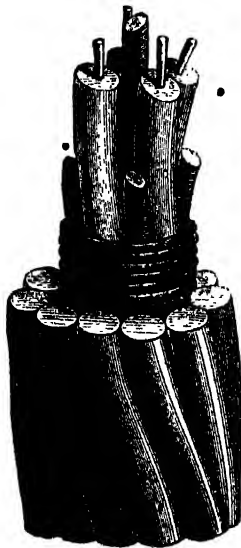
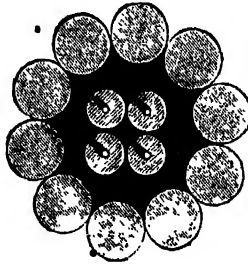
On July 27, after a voyage of fifteen days, the *Great Eastern* finished her work, and her part of the cable was attached to the American shore-end, which had been

laid by another vessel. Some of you will remember the rejoicings in the United States over the event. It surpassed all other achievements of the age, and equalled the invention of the telegraph itself.

Thus, after infinite labour and repeated failures, the brave men who undertook the work accomplished it. A year before, their third cable had broken in mid-ocean, and it was now proposed to "grapple" for it. The *Great Eastern* was fitted out with apparatus, which may be likened to an enormous fishing-hook and line, and was sent to the spot where the treasure had been lost. The line was of strong hemp interwoven with wire. Twice the cable was seized and brought almost to the surface. Twice it slipped from the disappointed fishermen, but the third time it was secured. It was then united with the cable on board, which was "paid out" until the great steamer again reached Newfoundland, and a second telegraph wire united the two continents.

The scene on board as the black line appeared above water was exciting beyond description. It was first taken to the testing-room, and a signal intended for Valentia

was sent over it, to prove whether or not it was perfect throughout its whole length. If it had proved to be imperfect, all the



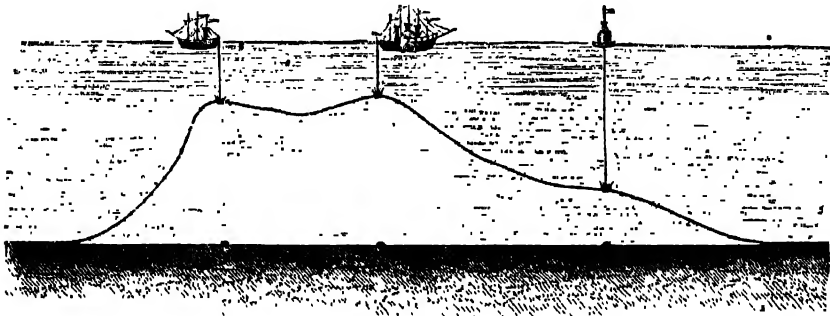
labour spent upon it would have been lost. The electricians waited breathlessly for an answer. The clerk in the signal-house at Valentia was drowsy when their message came, and disbelieved his ears. Many disinterested people, and even some of the promoters of the cable, did not think it possible to recover a wire that had sunk in thousands of fathoms of water. But the clerk in the little station connected with the shore-end of the cable of 1865 suddenly found himself in communication with a vessel situated in the middle of the Atlantic. The delay aggravated the anxious watchers on the ship, and a second signal was sent. How astonished that simple-minded Irish telegraph-operator was! Five minutes passed, and then the answer came. The chief electrician gave a loud cheer,

which was repeated by every man on board, from the captain down to his servant.

There are now four cables in working order, and the cost of messages has been reduced twenty-five per cent. The New York newspapers now contain nearly as much European news as the London newspapers themselves.

We take from Mr. Russell's graphic diary the account of the actual breaking of the cable, on Wednesday, the 2nd of August, which he has justly called, "a sad and memorable day." There had been a strong gale the night before, but the *Great Eastern* scarcely felt it, and went on paying out cable, without let or hindrance, at a high rate of speed—seven knots an hour:—

"About day-break the wind suddenly



GRAPPLING AND BUOYING THE CABLE.

shifted to N.N.W. and fell to a light breeze, and at four a.m., the course was altered to N.W. by W. $\frac{1}{2}$ W., the sea falling. Morning broke beautifully, and the cable ran out easily, at the rate of seven miles an hour. At 5.30 a.m., ship's time, the paddles were reversed by order from the electrician's room. In fact, at eight a.m., Greenwich time, or a minute after, while the electricians were passing the first of the half-hourly series of currents to the shore, the galvanometer detected a flaw of electricity which indicated a serious fault. The tests gave no result as to locality, for the fault was very varying; but it was generally believed to be not far from the stern of the ship. While Mr. Cyrus Field was on watch

in the tank, a little before the time of the accident, a grating noise was audible as the cable flew over the coil. One of the experienced hands immediately said, 'There is a piece of wire,' and called to the lookout man above to pass the information aft; but no notice appears to have been taken for some time of the circumstance. After the ship had been stopped, and the remainder of the fluke in which the fault was supposed to have occurred had been paid out, a piece of wire was seen projecting out of the cable in the fluke, and, on one of the men taking it in his fingers and trying to bend it down, the wire broke short off. It was nearly three inches long, and evidently of hard, ill-tempered metal, which

had flown out through the strands' of the cable in the tank. The fault in the cable which had gone overboard might obviously have been caused by such a piece of wire, and there could be no doubt that the wire of the outer covering of the cable was capable of inflicting injury on the gutta-percha it was intended to protect. The discovery was in some measure a relief to men's minds, because it showed that one certainly, and the second possibly, of the previous faults might have been the results of similar accident. It was remarked, however, that this fault occurred on the same watch as all the previous misfortunes had occurred.

As the fault was too serious to be overlooked, and as there was a difficulty in detecting its situation, preparations were made to get the picking-up apparatus ready. Previous to doing so, two cuts were made in the cable; the first near the old splice, between the main and the fore tank (cable all right); the second cut three miles in-board, which showed the fault to be in that portion of the cable which was overboard. The wire rope and the chain were now secured to the cable forward, which showed a maximum strain of $23\frac{1}{2}$ cwt.; and at 9.55, Greenwich time, the cable was severed and went over the stern, 1186 miles having been paid out when the end splashed into the water. With less difficulty than usual—in fact, with comparative facility—the cable was hauled in over the bows at 10.8 a.m., Greenwich time. The strain in it, according to the dynamometer, was from 50 cwt. to 55 cwt., though the latter figures represented the maximum only reached on one occasion. We were nearly in 2000 fathoms of water; but it was considered a favourable circumstance that we had not got a few miles farther, as we should then have been in the very deepest part of the Atlantic plateau. As far as could be ascertained, the ship was now over a gentle elevation, on the top of which there was only 1950 fathoms of water. The picking-up was, as usual, exceedingly tedious, and one hour and forty-six minutes elapsed before one

mile was got on board; then one of the engines' eccentric gear got out of order, so that a man had to stand by with a hand-spike, aided by a wedge of wood and an elastic band, to aid the wretched engine. Next, the supply of steam failed, and when the steam was got up it was found that there was not water enough in the boilers; and so the picking-up ceased altogether for some time, during which the ship forged ahead and chafed against the cable.

Let the reader turn his face towards a window, and imagine that he is standing on the bows of the *Great Eastern*, and then, of course, on his right will be the starboard; on his left the port side of the ship. In front, fixed in the bows, is a large V-wheel, as it is technically termed, with a smaller wheel of the same kind on the same axis at each side, on which the cable is drawn as it is pulled up from the sea by the picking-up apparatus, and thence is wound under the dynamometer and drum-wheels till it has passed the breaks and is coiled down aft in safety. There are at the bows of the *Great Eastern* two large hawse-pipes, the iron rims of which project nearly a foot beyond the line of the stem. After two miles of cable had been picked up, the *Great Eastern* was forced to forego the use of her engines because the steam failed, while her vast broadside was exposed to the wind, which was drifting her to the larboard or left-hand side, till by degrees an oblique strain was brought to bear on the cable, which came up from the sea to the bows on the right side. Against one of the hawse-pipes the cable now caught on the left-hand side, while the ship kept moving to the left, and thus chafed and strained the cable greatly against the bow; for now it was held by this projection, and did not drag from the V-wheel. The *Great Eastern* could not go astern lest the cable should be snapped; and without motion some way there is no power of steerage. At this critical moment, too, the wind shifted, so as to render it more difficult to keep the head of the ship up to the cable. As the cable then chafed so much that in two places damage was

done to it, a shackle chain and a wire rope belonging to one of the buoys were passed down the bow over the cable and secured in a bight below the hawse-pipes. These were hauled so as to bring the cable, which had been caught on the left-hand side by the hawse-pipes, round to the right-hand side of the bow, the ship still drifting to the left; while the cable, now drawn directly up from the sea to the V-wheel, was straining obliquely from the right with the shackle and rope attached to it. It was necessary to do this instead of veering away, as we were near the end of the cut of cable.

The cable and the wire rope together were now coming in over the bows in the groove in the larger wheel, the cable being wound upon a drum behind by the machinery, which was once more in motion, and the wire rope being taken in round the capstan. But the rope and cable, as I have tried to explain, were not coming up in a right line, but were being hauled in, with a great strain on them, at an angle from the right-hand side, so that they did not work directly in the V in the wheel. Still, up they came. The strain was shown on the dynamometer to be very high, but not near breaking-point. At last, up came the cable and wire rope shackling together on the V-wheel in the bow. They were wound round on it, slowly, and were passing over the wheel together, the first damaged part being inboard, when a jar was given to the dynamometer, which flew up from 60 cwt.—the highest point marked—with a sudden jerk, $3\frac{1}{2}$ inches. In fact, the chain shackle and wire rope clambered, as it were, up out of the groove on the right-hand side of the V of the wheel, got on the top of the rim of the V-wheel, and rushed down with a crash, on the smaller wheel, giving, no doubt, a severe shock to the cable to which it was attached. The machinery was still in motion, the cable and the rope travelled aft together, one towards the capstan, the other towards the drum, when, just as the cable reached the dynamometer, it parted, thirty feet from the bow, and with one bound leaped, as it were, into the sea."

"It is not possible," Mr. Russell goes on to say, "for any words to portray the dismay with which the sight was witnessed and the news heard." After brief consideration, it was determined to get out the grapnels, and search for the cable at the bottom of the Atlantic. Twice it was recovered and hooked, and raised a considerable way towards the surface, but proved too heavy for the strength of the lifting apparatus. The *Great Eastern* remained near the spot eight or nine days, and then, leaving two buoys to mark the position of the cable, turned her head back towards Europe. Mr. Russell thus describes the final attempt, on the evening of Friday, August 11th:—

"A line consisting of 1600 fathoms of wire rope, 220 fathoms of hemp rope, and 510 fathoms of Manilla was prepared and carefully examined, of which 1760 fathoms were pronounced good, the rest being rather suspicious. The grapnel soon touched the bottom. For some time the ship drifted onwards; but at 3.50 p.m., ship's time, the strain on the rope rose to 60 cwt. as it came in over the bows, easily, by the new capstan improvements. The ship's head varied from N.N.W. to W. by S., and as the rope came in the screw was set gently to work at times to keep it to the wind, which had increased somewhat, accompanied by showers of rain. The dynamometer index rose higher and higher, till it reached 80 cwt., and once, as a shackle came through the machinery, flew up to 106 cwt. It was a certainty that the Atlantic cable had been caught for the third time, and was fast held in the grapnel coming up from its oozy bed. Is there need to say that the alternations of hope and fear which agitated all on board reached their climax? There was an intensity of quiet excitement among us, such as men feel when they await some supreme decree. Some remained below, others refused to go forward, where the least jar of the machinery put their hearts in their mouths; others walked in the saloon or upon the after-deck abstractedly. At 9.40 p.m., Greenwich

time, just as 765 fathoms had been got in, a shackle on the hemp hawser passed through the machinery, and in a moment afterwards the rope parted near the capstan, and flew over the bows with a whistling sound like the rush of a round shot. In all the crowd of labourers not one was touched, because the men held on to their stoppers, and kept the end straight. But there lay the cable beneath, us once more, buried under coils of rope and wire, to which had just been added 1750 fathoms more. Orders were then given to get up steam, and all haste was made to return from the

disastrous spot, which will bear no monument of such solicitous energy, such noble toils, such ill-requited labours. The buoys which mark the place where so much went down will soon be waifs and strays in the strong seas of autumn, and nothing will be left of the expedition but entries in log-books, 'lat. 51 24, long. 38 59, end of cable N. 50 W. 1 3/4 miles,' and such memories as strengthen those who have witnessed brave fights with adverse fortune and are encouraged to persevere in the sure conviction that the good work will be accomplished in the end."

A MOUNTAIN OF COAL.



WHEN the blazing fire in our grates receives a large proportion of our attention, and the thoughts of many a housewife stray naturally to the coal-cellar and its supply, it may not be amiss to look into one of the great coal-cellars of our globe, and speculate upon what we find there. English consumers are perhaps never likely to burn a block from its countless tons of fuel, for they are stowed away in a certain county of Pennsylvania: and instead of being accumulated in the deep places of the earth, they lie heaped, as though in a profusion which had exhausted underground storage, in a mountain summit far above the level of the sea.

In the year 1792, a man walking over this summit saw, thrust out of the green ground, the angle of a rock of coal. He examined further, and found that the grass was merely a carpet over a flooring of such coal: he informed General Weiss, owner of the land, of the value which lay beneath his soil. The General, being ill advised, sold the whole crest of the mountain next year for a trifling sum to the Lehigh Coal Company, so called from the little river which they

hoped to make their channel of traffic. For the next thirty years they seemed to have made a bad bargain: before 1821, scarce a thousand tons of the treasure had been sold. But the forests of the country were dying out, perishing in ten thousand stoves, which ere long must have other fuel; the prejudice against coal gradually yielded to the necessity of the case, and, in 1830, the sales of the company had amounted to a hundred thousand tons. The desolate wilderness, amid which rose the coal summit, was becoming alive with miners' cabins and needful workshops; the wild rocky mountain stream called Lehigh was educated into a sort of tame canal, restrained within dams and deepened; twenty such dams and sluice-gates were erected on the watercourse, between the little town of Mauch Chunk, nearest the mine, and the newer settlement of Whitehaven: the latter so named from its analogy to the English port. The former name, Mauch Chunk, is Indian, signifying "The Bear's Mountain," a reminiscence of the olden forest times when as yet the country was verily "Penn's Sylvain," or woodland, and the red men hunting the savage denizens of the wilderness knew nothing of the grand civilizing agent—the coal—beneath their tread. A thousand feet above the little town

risers Mount Piscau, crested with the combustible summit before described, which, to use Kohl's words, "can be cut up like a loaf, in slices, and shoveled away."

Rather more elaborate, however, is the mode of working, even by his own account. Though in many places the coal lies just under the turf, so that a labourer's pickaxe and spade can lay it bare; yet, when the seams come to be sixty feet thick, and lie in sloping strata, a regular system of cutting open is required. When the beds are inclined to the surface at an angle of eighteen or twenty degrees, a passage called a gangway is bored horizontally from the side of the mountain through a series of the seams; from this gangway upwards, other openings are bored along the seams, and here the coal is excavated, and sent gliding down these shoots to the wagon standing on the tramway below the opening, which conveys it to the railway, in daylight, at the end of the horizontal passage. Tier above tier is worked thus—a congeries of level and sloping passages permeating the whole mine at regular intervals, wherever the coal lies at a suitable angle to roll by its own weight to the wagons. We should mention that in each of the shoots there is a slide or trap-door, to regulate the flow of the coal downwards. Mules are the motive power on the tramways inside the mine; but where the seams are horizontal, a steam-engine on the surface is used to draw up wagons full of coal through a shaft, as in our English mines.

"Robbing the pillars" is a perilous expedient, sometimes adopted by incautious workmen, and which has more than once led to disaster by weakening the supports of the passages. By order, walls ten feet thick are left at certain intervals. The traveller Kohl walked through many of the spacious vaulted passages, and climbed the ladders into the shoots, and thoroughly inspected the system of working. He found a thousand men there, healthy and hard-working; in their idle hours they constituted a corps of military volunteers on Summit Hill, and their homes were in a variety of villages in

the two neighbouring valleys of Mauch Chunk and Panther's Creek. They came up to their work daily, and the coal went down, by means of a railway without locomotive, worked by an endless chain. One line is called the "Heavy Down Track," because trains of loaded wagons glide by it to Mauch Chunk continually; another, the "Back Track," because it brings up empty coal wagons from the river continually, in general, about seventy times in a working day. The whole surface of the coal crest of the mountain is a network of rails. The second railway in the United States was opened here in 1827. Our traveller descended from the mines in a carriage whose own weight was its propeller; and the conductor's duty was to govern the break machinery as the train glided with arrow swiftness by a winding tramway through thickets.

This mountain of coal is calculated to comprise 180,000,000 tons! The world may be easy about its fuel for awhile, when we learn that this vast supply is but as a point amid the coal basins of the States. West of Ohio Valley and the Mississippi River are other coal measures, all bituminous, whereas those in the Pennsylvanian territory are altogether anthracite. The whole country is a concealed coal-field about Mauch Chunk; one county is called Carbon—an appropriate cognomen for land just veiling such stores of fuel. The Lehigh company possesses 6000 acres, each acre covering 30,000 tons of coal. Up to 1854 they had unearthed 4,000,000 of tons.

Another great coal-cellar of the States lies in the Swanton Valley, deep between two spurs of the Alleghanies. Here the mighty twin powers, iron and coal, lie side by side in strata. The whole town of Swanton—called after its founder, who yet lives and rules—is built upon a rock of coal; so that the vaults and basement stores of the houses are scooped from it. A great rail-mill, turning out 12,000 tons of rails annually, is worked by the aforesaid coal, in a spot where living men remember only a few peasants' huts

BIRD LIFE IN AFRICA.

THE ornithology of Africa presents a close analogy in many of its species to that of Europe and South Asia. Thus, on its northern coasts there is scarcely a single species to be found which does not also occur in the other countries bordering on the Mediterranean.

The large messenger or secretary bird, which preys upon serpents and other reptiles, is one of the most remarkable African birds. It is common near the Cape, and is not seldom domesticated. Of gallinaceous fowls, adapted to the poultry-yard, Africa possesses but a single genus, the guinea-hens, which, however, are found in no other



part of the world. These birds, of which there are three or four distinct species, go in large flocks of 400 or 500, and are most frequently found among underwood in the vicinity of ponds and rivers. There are, besides, many species of partridges and quails in different parts of Africa. Water-fowl of various species are also abundant on

the lakes and rivers, as are likewise various species of owls, falcons, and vultures, the latter of which are highly useful in consuming the offal and carrion, which might otherwise taint the air and produce disease.

Among the smaller birds of Africa are many species remarkable for the gaudiness and brilliancy of their plumage, or the

singularity of their manners and economy. Of the former kind may be mentioned the sunbirds, the lamprotorius, the bee-eaters, the rollers, the plantain-eaters, the parrots, the halcyons, and numerous smaller birds that swarm in the forests. Of the latter kind it will be sufficient to mention the honey cuckoo (*cuculus indicator*).

What can give us a prettier idea of the abundance of animal life in Central Africa than the following picture, sketched by Livingstone. He writes: "An hour at the masthead unfolds novel views of life in an African marsh. Near the edge and on the branches of some favourite tree, rest scores of plovers and cormorants, which stretch their snake-like necks, and in mute amazement turn one eye and then another towards the approaching monster. By-and-by the timid ones begin to fly off or take headers into the stream; but a few of the bolder or more composed remain, only taking the precaution to spread their wings ready for instant flight. The pretty ardetta, of a light yellow colour when at rest, but seemingly of a pure white when flying, takes wing and sweeps across the green grass in large numbers, often showing us where buffaloes and elephants are by perching on their backs. Flocks of ducks, of which the kind called *soriri*, being night-feeders, meditate quietly by the small lagoons until startled by the noise of the steam machinery. Pelicans glide over the water catching fish, while the swans and large herons peer intently into the pools. The large black and white spur-winged goose springs up, and circles round, to find out what the disturbance is, and then settles down again with a splash. Charming little red and yellow weavers remind one of butterflies as they fly in and out of the tall grass, or hang to the mouths of their pendent nests, chattering briskly to their mates within."

"The feathered race (says Cameron) is very numerous in Central Africa. The most common of the birds which we saw were fish-eagles, bustards, kites, vultures, white-necked crows, turtledoves, ortolans, saddle-billed storks on the Gombe, the Mpokwa,

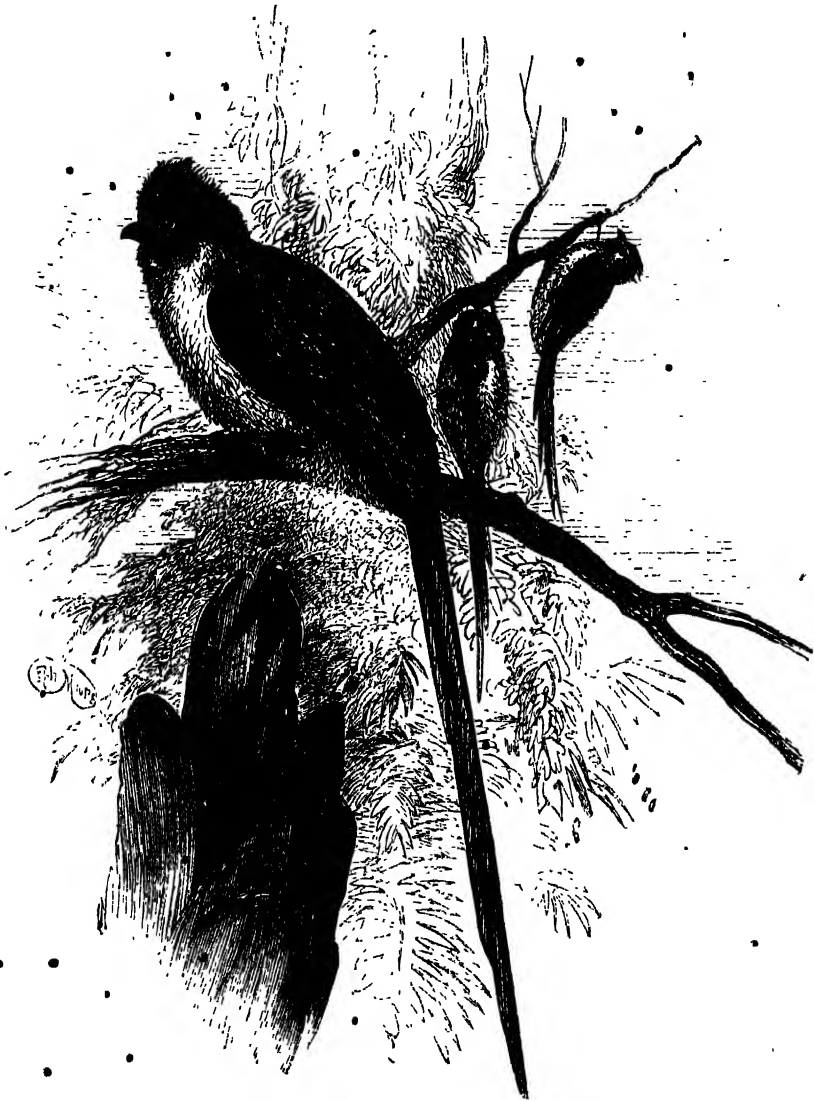
and the Ringufu. The *ibis nigra*, the *ibis religiosa*, toucans, wild geese (furnished with spurs on their wings), wild ducks, black Madagascar ducks, and gulls on the Tanganyika; paddybirds, thrushes, hammer-headed storks, pelicans, lead-coloured and tuft-headed cranes, divers, kingfishers, and Egyptian geese, eared grebes, terns, guinea-fowl, quail, ptarmigan, and florican. I also saw some ostriches in Ugogo, swans on Lake Ugombo, snipe and wagtails on the Tanganyika, near the Rusizi River, besides great and little owls, bats, barbets, and the baleniceps and sandpipers. Others which I recognised were hoopoes, parrots, jays, wrens, red-wings, golden fly-catchers, and the little egrets. This, as you may see, is far too long a list to enter into any description of the several species."

Amongst the natural history specimens brought to England by Lieutenant Cameron were a marabou stork—the largest bird of the adjutant species yet imported—and two very rare birds known as colies. The chestnut-backed coly was brought from the river Dande, about forty miles north of St. Paul de Loanda. The most formidable animal presented by Lieutenant Cameron is an ape of great height and size, known as a rib-nosed mandril. There are two yellow baboons, one sooty mangabey, an African cat, a curiously spotted Servaline cat, an Angola vulture, a Bandea ichneumon, and a Monteiro galago.

While in company with Livingstone, the now celebrated Stanley made a voyage of exploration. Some of his descriptions of natural objects are very graphic and interesting. He says: "We encamped under a banyan tree. Our surroundings were the now light-grey waters of the Tanganyika, an amphitheatrical range of hills, and the village of Niasanga, situated at the mouth of the rivulet Niasanga, with its grove of palms, thicket of plantains, and plots of grain, and cassava fields. Near our tent were about half a dozen canoes, large and small, belonging to the villagers. Our tent door fronted the glorious expanse of fresh water, inviting the breeze and the views of distant

Ugoma and Ukaramba, and the island of Murimu, whose ridges appeared of a deep blue colour. At our feet were the clean and well-washed pebbles, borne upward into tiny lines and heaps by the restless surf. A search amongst these would reveal to us

the material of the mountain heaps which rose behind and on our right, and left. There was schist, conglomerate sandstone, a hard white clay, an ochreish clay containing much iron, polished quartz, etc. Looking out of our tent, we could see a line on



THE CHESTNUT-BACKED COLLY.

each side of us of thick tall reeds, which formed something like a hedge between the beach and the cultivated area around Niasanga.

Among birds seen here, the most noted were the merry wagtails, which are regarded

as good omens and messengers of peace by the natives, and any harm done unto them is quickly resented. The other birds were crows, turtle-doves, fish-hawks, kingfishers, ibis, flocks of Whydah birds, geese, darters, paddybirds, kites, and eagles."

THE ICE HARVEST.



ICE and frozen snow were known as luxuries as far back as history records, the latter being mostly in use in the East. The mode of gathering it in winter, and transporting it for use in summer, and the method of preserving it in those intensely hot climates, was truly primitive, and frequently involved great labour and cost. In many portions of Asia the snow was gathered in sacks, far up in the mountains, and transported to the principal cities on the backs of mules, there preserved in cisterns sunk in the earth, and packed carefully between layers of straw. This method still prevails in some sections.

But up to the commencement of the present century, in those climates where the temperature never reaches the freezing point, ice was a luxury that few beyond the wealthiest could indulge in. In India, as also among the ancient Greeks and Romans, artificial ice was produced in small quantities, and within the last half-century successful experiments in its manufacture have been made both in this country and Europe.

The natural production, however, of our northern climates, together with the great facility for transportation, has almost entirely superseded the use of this artificial movement. It is astonishing to what an extent an article, once regarded as a simple luxury in non-producing countries, and in the northern latitudes as an article of no computed practical value, has become recognised in the commerce of the world.

One hardly realizes that the frozen lakes and rivers of the North furnish labour for thousands who would otherwise be unemployed during the greater portion of the winter months; that the ice trade employs millions of capital; that in the revenue to

the carrying trade of the United States, both foreign and coastwise, it ranks next to cotton and grain, and frequently exceeds the latter; that the universal practical use to which it is applied in the preservation of meats, fruits, and vegetables, has, within the past thirty years, produced an entire revolution in the system of domestic economy, to say nothing of the blessings it has brought to suffering humanity in our hospitals, and in our pestilence-stricken cities.

The transportation of ice by sea was not thought of until the commencement of the present century. The world is indebted for the beneficent results that has followed from the introduction of the ice trade, to Frederick Tudor, a wealthy and eccentric citizen of Massachusetts, well known seventy-five years ago for his extensive salt-works at Nahant.

In 1805, the yellow fever raged through the West India islands, the towns and cities were decimated, and the officers and crews of the European fleets were almost entirely swept off by the disease. The need of ice was very greatly felt throughout the islands. In the winter of that year, Mr. Tudor cut from a small pond, situated on a plantation of his own in Saugus, some two or three hundred tons of ice, hauled it on teams to Charlestown, loaded a portion of it into the brig *Favourite*, and sailed with it to the island of Martinique. The venture was regarded by his friends as a wild and visionary one, and he suffered nearly as much ridicule as his contemporary eccentricity "Lord Timothy Dexter," did when he shipped the warming-pans; but one of Mr. Tudor's prominent points of character, and one exemplified in nearly every act of his long and useful life, was an utter contempt for other people's opinions; he never asked advice of any one, and always turned his back upon all that was offered. The strength of his purpose was generally mea-

sured by the amount of opposition he encountered. To those who were acquainted with him, when in one of his pleasant moods, he would often delight to rehearse his early experience. There was nothing of fancy or mere speculation that induced him to embark in this experiment. He had made the subject a study, and the results of his theories effectually vindicated their soundness.

The first experiment proved a failure in a pecuniary point of view, as Mr. Tudor himself predicted, but it satisfied him as to the future, when he should have had time to work out the problems presented by the experiment.

The English Government was the first to appreciate the advantages likely to accrue to its colonists from the introduction of ice; and ten years after Mr. Tudor's first shipment, or shortly after the close of the war of 1812, he received and accepted overtures that were eminently favourable; the first was the grant of a monopoly of the trade upon such conditions that they were readily acceded to; the second was the release of certain port dues (then very heavy) to all ships bringing ice.

The island of Jamaica was then in the zenith of its wealth and commercial prosperity, and the richest colonial possession of Great Britain. Mr. Tudor established his ice-houses at Kingston, the commercial capital of the island. This was the first prominent and *permanent* point,—although this distinction has been accorded by some to Havana, and up to the time of emancipation the trade was quite brisk. Mr. Tudor also secured the monopoly of Havana, with liberal arrangements for the introduction of ice in other ports on the island of Cuba. The Tudor Company still retain the monopoly of Havana and the island of Jamaica. All other ports in the West Indies are practically open to competition. Of these the principal are, St. Thomas, Martinique, Barbadoes, Trinidad, Demerara (on the main), Cienfuegos, Santiago de Cuba, Manzanillo. The ice supplied to these ports is shipped exclusively from Boston.

Next, in order after the West India ports comes the introduction of ice into our domestic ports by Mr. Tudor. The first cargo was shipped to Charleston, South Carolina, then the most important commercial port in the Southern States, in the year 1817.

In 1818 Mr. Tudor established a branch of the trade in Savannah, then, as for years afterward, a rival of Charleston. In 1820 he established ice-houses in New Orleans, which city, thirty years later, became the largest consuming city in the United States, south of Philadelphia.

It is a singular fact that the bulk of ice consumed was in foreign and southern domestic ports. This, however, may be accounted for in this way: before the introduction of Croton in New York, and Cochituate in Boston, the deep wells in both cities answered the double purpose of supplying cool spring water for drink, and as reservoirs for keeping meats, butter, milk, etc., cool in summer. It is not necessary that one should be very old to remember when we did not have ice chests in our markets, and refrigerators in our hotels and private residences. The dairyman who brought his butter and milk to market, and the farmer and butcher who slaughtered his beef and mutton during the hottest of the summer months, had his little ice-house, or cellar, containing from ten to fifty tons, which answered every purpose. Now there are delivered and consumed in New York city alone, during the winter months, more tons of ice than were cut, shipped, and consumed, in the United States in, a twelve-month, thirty years ago.

In May, 1833, Mr. Tudor, at the request of English and American merchants resident in Calcutta, sent a small cargo of about 200 tons to that port. A Calcutta voyage in those days involved about six months for the passage out. The result, like that of his first shipment to the West Indies, was not a pecuniary success, but it proved that ice brought twenty thousand miles could, with all the attendant waste and losses, successfully compete in prices with that prepared by the natives. The result was

the establishment of a trade which has steadily increased in volume and importance, and which enables Boston to hold the key to the rich and extensive commerce between Calcutta and the United States.

In 1834, Mr. Tudor extended his trade in another direction, and sent a cargo to Rio Janeiro. Up to 1836, Mr. Tudor was the ice king of the world. At this remove of time we can easily figure up results, but words are inadequate when one attempts to do justice to the memory of this wonderful man, whose genius and ability have opened up such blessings to the race. He saw the conception of his brain take form and shape; he nursed it, and watched over it through trials and obstacles that would have disheartened one less confident in his own resources; he lived to see it at its full maturity, a giant among men and nations. He had succeeded, but this success did not narrow him, and he was willing, if not gratified, in seeing others spring up to share in and increase the trade he had laboured so diligently to build up.

In 1842, certain intimations were received from parties in London, which induced a shipment of Boston ice to that city.

Previous to this the aristocracy and the London clubs had depended for their ice upon small shallow reservoirs or wells, where the water was let in periodically and frozen. These, with the exception of a comparatively large well-shaped reservoir on the summit of Highgate Hill, constituted all the resources of London in that respect.

At that date fancy drinks were almost unheard of in the clubs, taverns, and gin palaces of London. Mr. Hittinger conceived the idea of introducing these, to show to what extent ice was used in "the States" for this purpose. He therefore secured the services of several bar-keepers, whom he had initiated into the mysteries of mixing juleps, smashes, cocktails, and other drinks known only in Yankeeland. His experience, as he relates it himself, is very amusing,—

"I went out in the steamer, so as to make arrangements for the arrival of the bark and

cargo, delivered my letters, talked with parties, and felt perfectly sure that I had struck a vein. In due time the *Sharon*, having made a good passage, arrived in the Thames. The thing had been talked over so much, that the cargo of Boston ice was as well advertised as it could have been in the columns of the *Times*. But, after all, it appeared to them a strange fish that no one dared to touch. My feelings were just about the temperature of my ice, and wasting as rapidly. At last, I was introduced to the Chairman or President of the Fishmongers' Association, an association which I was not long in discovering had the merit of wealth, if not of social position. He was sociable, and seemed to comprehend my position if I didn't *his*. Matters were soon arranged; a magnificent hall or saloon had been secured; I ascertained that my bar-keepers, through constant drill, had attained the correct sleight of hand in mixing the drinks. The hour arrived. The hall was long and brilliantly lighted. After the company was seated, the chairman introduced me and the subject matter of the evening's discussion. Now, thought I, I am all right. At a given signal the well-trained waiters appeared, laden with the different drinks. The effect was gorgeous, and I expected an ovation that no Yankee had ever had. But, alas! the first sounds that broke the silence were, 'I say—aw, waitaw, a little 'ot wataw, if you please; I prefer it 'alf 'n' 'alf.' I made a dead rush for the door, next day settled my bills in London, took the train for Liverpool, and the steamer for Boston, and counted up a clear loss of 1,200 dollars."

Boston, from its commercial position, as well as its close proximity by rail to all the principal points of production, must be the advantageous port for shipment. An order for a cargo of ice from that port can be filled at a few hours' notice. It is seldom, if ever, without the requisite tonnage; and the appointment of the railroads bringing the ice to East Boston and Charlestown are so perfect, that from one hundred to five hundred cars can be placed at once.

But the ice trade is to-day in its infancy ; every year it is attracting more attention. It must soon outgrow the means of individual enterprise, and powerful corporations must follow. Steam-ships, with air-tight compartments and built for great speed, must take the place of sailing ships, the saving by which, in the one item of waste, would suffice to build such steamers. Again, as the new ports of the East are being opened up to American commerce, the Pacific coast will have to supply the ice for India, China, Japan, etc. Already parties are prospecting for that region, and it would not be surprising to see, before the close of another decade, spacious ice-houses established in Alaska, Oregon, and California.

Let us now see what modern improvements have effected in reducing the cutting, housing, and shipping of ice to a system.

A little more than forty years ago, Mr. Tudor employed as his foreman Mr. Nathaniel Wyeth, of Cambridge, a man of remarkable ability. Up to this time (no reliable data are at hand to fix the year) ice was housed in subterranean vaults, generally excavated on the slope of the bank and removed some distance from the shores of the pond. Mr. Wyeth conceived the idea of erecting buildings without cellars and handy to the shore. These buildings were of wood, *battened* from the base, and were double-walled, the space between the inner and outer being filled with tan or sawdust. These were capable of holding from three to ten thousand tons each.

The next progressive move was in the direction of cutting. When the entire crop hardly exceeded five thousand tons per annum, the original method of scraping the pond answered well enough ; so did the method of "shaving" the ice and sawing it into blocks. The scraper was a rudely constructed machine moved by hand ; the shaving off of the porous or snow ice was done with broad axes ; the cutting was done by means of a common cross-cut saw, one handle being taken off. One can imagine the laborious work thus entailed.

Mr. Wyeth at once put his ingenuity to

work and produced the tools that are now in use throughout the country, and which have reduced the cost of cutting to a mere nominal figure. Under the old process, one season would not suffice to secure a year's supply. Now, the cutting and housing seldom occupy more than three weeks, and the average daily work by one concern of housing six thousand tons is not considered remarkable.

It is seldom that clear ice is secured, that is, ice without a fall of snow upon it. With the modern improvements, this coating of snow is not regarded as detrimental. In fact, the thin layer of snow ice is regarded as a preservative of the clear ice.

As soon as the pond is completely closed, the ice, with the atmosphere at a temperature of ten degrees above zero, forms very rapidly. If, after it has attained the thickness of say three or four inches, capable of bearing a man, a fall of two or three inches of snow follows, then the workmen begin to "sink the pond," as it is termed. This is done by cutting holes an inch or two in diameter, and at three or four feet apart, thus admitting the water to the surface and submerging the snow, which forms the snow ice. With a steady temperature of ten degrees above zero for a week or ten days, the ice will have formed to the desirable thickness, say an average thickness of fifteen inches. We say average, because on many ponds—Fresh Pond, for instance, which is fed by warm springs—the freezing differs. The thickness is ascertained by boring holes with a two-inch auger. If, after the ice has formed sufficiently to bear horses, snow falls, then the scraping process begins, and continues with each fall of snow till the ice is thick enough to cut.

A space on the pond, say six hundred feet in width, is marked out and the snow is scraped from either side toward the centre, forming what is called "the dump." Some seasons these dumps will rise to a great height, and then, through their immense weight, sink to a level. The process of scraping the snow into "dumps" is not only expensive, but wastes a great deal of

ice, as only that cleared off can be cut. When the ice is twelve inches thick it will yield about a thousand tons to the acre; but so much is wasted by scraping snow, high winds, and various other causes, that it is only in exceptionally "good years" that more than half the average of a pond can be cut and stored.

After the snow is scraped off, the lining of the pond, so called, begins. This is done by taking two sights as in common railroad engineering. The targets are set, representing the line between two supposed points, say A and B. A straight edge is then run by means of a common plank between the points A and B, then striking from the angle A, it runs at right angles with the line B. Only two lines are necessary, one from A to B, and the other from B to an indefinite point.

The liner proceeds with a double instrument, or what is called a "guide and marker;" the guide is a smooth-edged blade that runs in the groove made by the square edge; the marker is a part of the same instrument, and runs over the grooved lines laid out with the cutter. As soon as the machine reaches the objective point, it is turned over by an ingenious arrangement, so that returning, the guide runs in the freshly cut groove, and the marker cuts another groove forty-four inches distant. In this way the machine goes over the whole field, running one way, the last groove it cuts forming the boundary of the second side; then, commencing on this boundary line, it runs at right angles with the first, and goes over the entire field, cutting the ice into blocks of the required dimensions. The marker cuts a groove two inches in depth. Following the marker come the cutters or ploughs with sharp teeth measuring from two inches in length to ten or twelve, and used according to the thickness of the ice. Then comes the snow-ice plane, which shaves off the porous or snow ice, it first being determined by auger-boring how many inches of snow ice there are. The ice is now ready for gathering. It is broken off into broad rafts, then sawed into lesser

ones, then barred off in sections and floated into the canal. The calking operation consists in filling the groove lines or interstices with ice chips to prevent the water from entering and freezing; this is only necessary in very cold weather. The rafts or sheets of cakes are generally thirty cakes long by twelve wide, frequently longer. The ends have to be sawed, but every twelfth groove running lengthwise of the raft or sheet is cut deeper than the other, so that one or two men can, with one motion of the bar, separate it into strips ready for the elevator canal.

As the ice enters upon the van it is cut into single cakes of forty-four inches square. The process of elevating the ice has been reduced to almost scientific perfection. It is done by means of an endless chain fitted with buckets, and the hoisting power is a steam-engine. The ice-houses contain from three to five vaults or bins, corresponding to the several storeys in a warehouse. A single range of buildings will contain five or more. The elevator is arranged so that one flat or storey containing these five bins or vaults can be filled simultaneously; that is, as the ice leaves the elevator and is passed off on the wooden tramway of the platform, a man stands at the entrance of each vault to turn the cakes of ice in, the first cake from the elevator going to the farthest opening, and then in regular rotation till the first or lower flat in the range is filled. When the blocks are taken from the houses and loaded on board cars for shipment, they are reduced to twenty-two inches by a similar process of grooving and burring.

None but the most experienced workmen are employed in storing the ice, as this requires a quick eye, a steady hand, and good judgment.

As each flat or storey is completed, the openings at either end are securely and tightly closed, and when the whole building is filled up to the bed-plate, the space between that and the hip of the roof is filled with hay, thus providing a sure protection against waste by shrinkage, which seldom exceeds one foot during the season.

ESCAPE OF THE "JUNO."



AN interesting account is, given by the late Captain Basil Hall of a bold feat performed by Sir Samuel Hood, in 1791, during the revolutionary war with France. From this anecdote even the most pacific reader may learn a lesson of the value of mental collectedness in circumstances of excitement and peril.

"A trifling incident," says Captain Hall, "occurred, which suggested to our thoughts an important service of Sir Samuel Hood's, which, although it be familiarly known in the navy, may not be so fresh in the recollection of persons on shore. A question arose in the boat as to whether or not the land-wind was blowing. Some said there was a breeze up the river, while others maintained that the wind blew down towards the sea. The admiral let us go on speculating and arguing for some time, and then said, 'You are both wrong; there is not a breath of air either up or down the river. At all events we shall soon see, if you will strike me a light.' This was done accordingly; and the admiral, standing on the after-thwart, held the naked candle high over his head, while the men ceased rowing.

'There, you see,' exclaimed he; 'the flame stands quite upright, which proves, that if there be any breeze at all, it blows no faster than the stream runs down.'

'As he yet spoke, the flame bent from the land, and in the next instant was puffed out by a slight gust from the forest.

'Ah! that's something like!' exclaimed the commander-in-chief; adding, in an under tone, as he resumed his seat, 'I have known the time when a flaw of wind not greater than has just blown out this candle has rendered good service to His Majesty.'

We knew what was meant, and so will every naval man; but others may be interested by being told, that early in the year 1794, when Captain Hood commanded His Majesty's ship *Juno*, he had very nearly lost his ship in a most extraordinary manner. The port of Toulon, though in possession of the English at the time of his departure on a short trip to Malta, had been evacuated while the *Juno* was absent; and as the land was made in the night, no suspicion of that important change of affairs arose in the mind of any one. With his wonted decision, therefore, into the port he dashed; for, although the *Juno* carried no pilot, Captain Hood's knowledge of every port he had once visited rendered him comparatively indifferent on that score. A couple of the sharpest-sighted midshipmen were stationed with glasses to look out for the fleet; but no ships were seen—for the best of all reasons—none were there!

One vessel only, a small brig, could be detected, and the captain supposing the fleet had run into the inner harbour during the recent easterly gale, resolved to push up likewise. The batteries all kept quiet, and though the brig hailed the frigate as she passed in a language so indistinct that no one could make it out, not the least suspicion was excited.

Captain Hood, in his official letter to Lord Hood, says, 'I suppose they wanted to know what ship it was, I told them it was an English frigate called the *Juno*. The brig, however, was not quite so courteous in return; for they merely replied by the word 'Viva,' but made no answer to the captain's repeated inquiry, both in English and French, as to the brig's name, and the position of the British admiral's fleet. As the *Juno* pressed under the stern of this treacherous little craft, a voice called out, 'Luff! luff!' which naturally induced Captain Hood to put his helm down, from an

idea that shoal water lay close to leeward of him. Nothing could have been more adroitly managed by the Frenchman, for before the frigate came head to wind, she stuck fast upon the shoal, to which the words 'Luff! luff!' had no doubt been intended to direct her.

A boat was now observed to proceed from the brig to the town. As there was but little wind, and the water perfectly smooth, the *Juno's* sails were clewed up and handed; but before the men were all off the yards, a gust of wind came sweeping down the harbour, and drove her off the shoal so suddenly as to give her brisk sternway. The anchor was speedily let go, but when she tended, the after-part of her keel took the ground, and the rudder could not be moved. The launch and cutter being instantly hoisted out, the usual preparations were made to lay out a kedge, to heave the ship off.

At this critical moment a boat came alongside. The people appeared anxious to get out of her, and two of them, apparently officers, came up the side. They said it was the regulation of the port, as well as the commanding officer's orders, that ships should go further into the harbour, there to perform ten days' quarantine. In the despatch relating to this transaction, Captain Hood says, 'I kept asking them where Lord Hood's ship lay;' and those who remember Sir Samuel's impatient manner when any one to whom he addressed himself trifled with his questions, will easily imagine how he must have perplexed and overawed the two Frenchmen, who really knew not what to do or say next.' In the meantime, one of the mids, who happened to be thrusting his head forward, after the investigating manner of this enterprising class of officers, said apart to the captain—

'Why, sir, they wear national cockades!'

'I looked at one of their hats more steadfastly,' says Captain Hood in his narrative, 'and by the moonlight clearly distinguished the three colours.'

'Perceiving they were suspected,' con-

tinues Sir Samuel in his narrative; 'and on my questioning them again about Lord Hood, one of them replied in French, "Be easy; the English are fine fellows, and we treat them well. The English admiral left us some time ago."'

Sir Samuel well says that it may be more easily conceived than words can express what he felt at that moment. In one instant the situation of the poor *Juno*, which was almost desperate, became known throughout the ship. The officers naturally crowded round their captain to learn the worst; while the Frenchmen, bowing to the right and left, grinned and apologised for the disagreeable necessity of making them all prisoners! The rest of the singular story, unique in the history of the navy, and altogether wonderful considering the formidable nature of the trap into which the frigate had fallen, will be best told in the words of the accomplished officer himself, to whose presence of mind, courage, and professional dexterity, the escape of the ship was entirely due. The personal regard in which the captain was held by every officer, man, and boy on board, and the thorough confidence which they possessed in his talents, enabled him to undertake a service which an officer held in less esteem might have found it very difficult to carry through. It used, indeed, to be said of Hood's ship, that, fore and aft, there was but one heart and mind.

After describing the deportment of the French officers, he goes on to say, in his despatch, that 'a flaw of wind coming down the harbour, Lieutenant Webley said to me, "I believe, sir, we shall be able to fetch out if we can get her under sail." I immediately perceived we should have a chance of saving the ship; at least if we did not, we ought not to lose her without some contention. I therefore ordered every person to their respective stations, and the Frenchmen to be sent below. The latter, perceiving some bustle, began to draw their sabres; on which I directed some of the marines to take the half pikes and force them below, which was soon done.

'I believe in an instant such a change in people was never seen—every officer and man was at his duty ; and I do believe, within three minutes every sail in the ship was set, and the yards braced ready for casting.' The steady and active assistance, of Lieutenant Turner and all the officers prevented any confusion in our critical situation ; and as soon as the cable was taut, I ordered it to be cut, and had the good fortune to see the ship start from the shore. The head sails were filled ; a favourable flaw of wind coming at the same time gave her good way, and we had every prospect of getting out if the forts did not disable us. To prevent our being retarded by the boats, I ordered them to be cut adrift, as also the French boat.

'The moment the brig saw us begin to loose sails, we could plainly perceive she was getting her guns ready, and we also saw lights in all the batteries. When we had shot far enough for the brig's guns to bear on us, which was not more than three ships' lengths, she began to fire ; also a fort a little on the starboard bow, and soon after all of them, on both sides, as they could bring their guns to bear. As soon as the sails were well trimmed, I beat to quarters to get our guns ready, but not with an intention of firing till we were sure of getting out. When abreast of the centre of Cape Septet, I was afraid we should have been obliged to make a tack ; but as we drew near the shore, and were ready to go about, she came up two points, and just weathered the cape. As we passed very close along that shore, the batteries kept up as brisk a fire as the wetness of the weather would admit. In spite of all, however, the ship was worked out unharmed.'

The whole of this admirable piece of service was performed so quickly, and at the same time with so much coolness, that there occurred little or no opportunity for any remarkable individual exertion. Everything, as I have heard it described by Sir Samuel Hood himself and by the officers, went on as if the ship had been working out of Plymouth Sound at noonday. One

little incident, however, which caused much amusement in the ship, will help to show the degree of regard in which Sir Samuel was held by those immediately about him, and to disprove the proverb of no man being a hero to his valet de chambre.

Dennis M'Carty, an old and faithful servant of Captain Hood, who was quartered at one of the main-deck guns in the cabin, stood firm enough till the batteries opened on the *Juno*. No sooner had the firing commenced, and the first shot came whizzing over and through all parts of the ship, than Dennis, to the great amaze and scandal of his companions, dropped the side tackle-fall, and fairly run off from his gun. Nothing, however, could be further from poor Pat's mind than fear, except fear for his master, behind whom he soon stationed himself on the quarter-deck ; and wherever Captain Hood moved, there Dennis followed, like his shadow. The poor fellow appeared totally unconscious of any personal danger to himself, though the captain was necessarily in the hottest of the fire. At length Sir Samuel, turning suddenly round encountered the Irishman full butt.

'Ho ! master Dennis,' exclaimed the captain, 'what brings you here ? and why do you keep running about after me ? Go down to your gun, man !'

'Oh, your honour,' replied Dennis, 'I thought it likely you might be hurt, so I wished to be near you to give you some help.'

'There was no resisting this ; the captain laughed in the midst of the battle ; and poor Dennis was allowed to take his own way, having no care for himself.'

Sir Samuel Hood's *forte* appears to have been that invaluable quality of all great commanders, promptitude in seeing what was best to be done, and decision of purpose in carrying it into execution. At the moment of greatest doubt and difficulty, he appears invariably to have taken those useful practical views which the calmest subsequent reflection proved to have been the most expedient."



THE LION'S RIDE.

WOULDST thou view the lion's den?
 Search afar from haunts of men,—
 Where the reed-encircled fountain
 Oozes from the rocky mountain,
 By its verdure far descried
 'Mid the desert brown and wide.
 Close beside the sedgy brim
 Couchant lurks the lion grim,
 Waiting till the close of day
 Brings again the destined prey;
 Heedless at the ambushed brink
 The tall giraffe stoops down to drink:
 Upon him straight the savage springs
 With cruel joy!—The desert rings
 With clanging sound of desperate strife—
 For the prey is strong and strives for life;
 Now, plunging, tries with frantic bound
 To shake the tyrant to the ground;
 Then burst like whirlwind through the waste,
 In hope to 'scape by headlong haste;

While the destroyer on his prize
 Rides proudly—tearing as he flies.
 For life, the victim's utmost speed
 Is mustered in this hour of need:
 For life! for life! his giant might
 He strains, and pours his soul in flight;
 And mad with terror, thirst, and pain,
 Spurns with wild hoof the thundering plain.
 'Tis vain;—the thirsty sands are drinking
 His streaming blood, his strength is sinking;
 The victor's fangs are in his veins,
 His flanks are streaked with sanguine stains;
 His panting breast in foam and gore
 Is bathed:—he reels—his race is o'er!
 He falls—and, with convulsive throes,
 Resigns his throat to the raging foe;
 Who revels amidst his dying moans:—
 While gathering round, to pick his bones,
 The vultures watch, in gaunt array,
 Till the gorged monarch quits his prey.

ASCENT OF THE PEAK OF TENERIFFE.



MS. BRASSEY'S account of an eleven months' cruise in the yacht *Sunbeam* is one of the most interesting works of travel that has appeared for many years. We give her description of her ascent of the famous Peak of Teneriffe:—

"We all rose early, and were full of excitement to catch the first glimpse of the famous Peak of Teneriffe. There was a nice breeze from the north-east, the true trade wind, we hope, which ought to carry us down nearly to the line. The morning being rather hazy, it was quite ten o'clock before we saw the Peak towering above the clouds, right ahead.

As we approached, it appeared less perpendicular than we had expected, or than it is generally represented in pictures. The other mountains too, in the centre of the island, from the midst of which it rises, are so very lofty that, in spite of its conical sugar-loaf top, it is difficult at first to realize that the Peak is 12,180 feet high. We dropped anchor under its shadow in the harbour of Orotava in preference to the capital Santa Cruz, both on account of its being healthier, and also in order to be nearer to the Peak, which we wished to ascend. The heat having made the rest of our party rather lazy, Captain Lecky and I volunteered to go on shore to see the Vice-Consul, Mr. Goodall, and try to make arrangements for our expedition. It was only 2 p.m., and very hot work, walking through the deserted streets; but luckily we had not far to go, and the house was nice and cool when we got there. Mr. Goodall sent off at once for a carriage, despatching a messenger also to the

mountains for horses and guides, which there was some difficulty in obtaining at such short notice. Having organised the expedition, we re-embarked to dine on-board the yacht, and I went to bed at seven, to be called again, however, at half-past ten o'clock. After a light supper, we landed and went to the Vice-Consul, arriving there exactly at midnight. But no horses were forthcoming, so we lay down on our rugs in the patio, and endeavoured to sleep, as we knew we should require all our strength for the expedition before us.

There were sundry false alarms of a start, as the horses arrived by ones and twos from the neighbouring villages, accompanied, by their respective owners. By two o'clock all our steeds, twelve in number, had assembled, and in another quarter of an hour we were leaving the town by a steep stony path, bordered by low walls. There was no moon; for the first two hours it was very dark. At the end of that time we could see the first glimmer of dawn, and were shortly afterwards able to distinguish each other and to observe the beautiful view which lay below us as we wended our way up and up between small patches of cultivation. Soon we climbed above the clouds, which presented a most curious appearance as we looked down upon them.

The stratus through which we had passed was so dense and so white that it looked exactly like an enormous glacier, covered with fresh-fallen snow, extending for miles and miles; while the projecting tops of the other Canary Islands appeared only like great solitary rocks.

The sun had already become very oppressive, and at half-past seven we stopped to breakfast and to water the horses. Half-past eight found us in the saddle again, and we commenced to tra-

verse a dreary plain of yellowish-white pumice stone, interspersed with huge blocks of obsidian, thrown from the mouth of the volcano. At first the monotony of the scene was relieved by large bushes of the yellow broom in full flower, and still larger bushes of beautiful *Retama blanca*, quite covered with lovely white bloom, ascending the air with its delicious fragrance, and resembling huge tufts of feathers, eight or nine feet high. 'As we proceeded, however, we left all trace of vegetation behind us. It was like the Great Sahara. On every side a vast expanse of yellow pumice-stone sand spread around us, an occasional block of rock sticking up here and there, and looking as if it had indeed been fused in a mighty furnace. By half-past ten we reached the 'Estancia de los Ingleses,' 9,639 feet above the level of the sea, where the baggage and some of the horses had to be left behind, the saddles being transferred to mules for the very steep climb before us. After a drink of water all round, we started again, and commenced the ascent of the almost perpendicular stream of lava and stone, which forms the only practicable route to the top. Our poor beasts were only able to go a few paces at a time without stopping to regain their breath. The loose ashes and lava fortunately gave them a good foothold, or it would have been quite impossible for them to get along at all. One was only encouraged to proceed by sight of one's friends above looking like flies clinging to the face of the wall. The road, if such it can be called, ran in zigzags, ²²² of which was about the length of two horses, so that we were in turns one above another. There were a few slips and slides and tumbles, but no important casualties; and in about an hour and a half we had reached the 'Alta Vista,' a tiny plateau, where the horses were to be left.

The expedition so far had been such a fatiguing one, and the heat was so great that the children and I decided to remain here, and to let the gentlemen proceed alone to the summit of the Peak. We

tried to find some shade, but the sun was so immediately above us that this was almost an impossibility. However, we managed to squeeze ourselves under some slightly overhanging rocks, and I took some photographs while the children slept. The guides soon returned with water barrels full of ice, procured from a cavern above, where there is a stream of water constantly running; and nothing could have been more grateful and refreshing.

It was more than three hours before Tom and Captain Lecky re-appeared, to be soon followed by the rest of the party. Whilst they rested and refreshed themselves with ice, they described the ascent as fatiguing in the extreme, in fact, almost an impossibility for a lady. First, they had scrambled over huge blocks of rough lava to the tiny plain of the Rambleta, 11,466 feet above the level of the sea, after which they had to climb up the cone itself, 530 feet in height, and sloping at an angle of 44 degrees. It is composed of ashes and calcined chalk, into which their feet sank, while, for every two steps they made forwards and upwards, they slipped one backwards. But those who reached the top were rewarded for their exertions by a glorious view, and by the wonderful appearance of the summit of the Peak.

The ground beneath their feet was hot, while sulphurous vapours and smoke issued from various small fissures around them, though there has been no actual eruption from this crater of the volcano since 1704. They brought down with them a beautiful piece of calcined chalk, covered with crystals of sulphur and arsenic and some other specimens. Parched and dry as the ground looked where I was resting, a few grains of barley dropped by mules on the occasion of a previous visit, had taken root and had grown up into ear; and there were also a few roots of a sort of dog-violet, showing its delicate lavender-coloured flowers 11,000 feet above the sea, and far beyond the level of any other vegetation. It was impossible to ride down to the spot where we had left the baggage

animals, and descent was consequently very fatiguing, and even painful. At every step our feet sank into a mass of loose scorix and ashes; so we went slipping, sliding, and stumbling along, sometimes running against a rock, and sometimes nearly pitching forward on our faces. All this too beneath a blazing sun, with the thermometer at 78°, and not a vestige of shade. At last Tom and I reached the bottom, where after partaking of luncheon and draughts of quinine, we lay down under the shadow of a great rock to recruit our weary frames.

Refreshed by our meal, we started at six o'clock on our return journey, and went down a good deal faster than we came up. Before the end of the pumice-stone or Retama plains had been reached, it was nearly dark. Sundry small accidents occurring to stirrup leathers, bridles, and girths—for the saddlery was not of the best description—delayed us slightly, and Tom, Dr. Potter, Alhnutt, and the guide having got on ahead, we soon lost sight of them. After an interval of uncertainty, the other guides confessed that they did not know the way back in the dark. This was not pleasant, for the roads were terrible, and during the whole of our journey up from the port to the Peak, we had met only four people in all,—two goat-herds with their flocks, and two 'neveros' bringing down ice to the town. There was therefore not much chance of gaining information from any one on our way down. We wandered about among low bushes, down watercourses, and over rocks for a long time. Horns were blown, and other means of attracting attention were tried; first one and then another of the party, meanwhile, coming more or less to grief. My good little horse fell down three times, though we did not part company; and once he went up a steep bank by mistake, instead of going down a very nasty watercourse, which I did not wonder at his objecting to. I managed to jump off in time, and so no harm was done; but it was rather anxious work.

About ten o'clock we saw a light in the

distance and with much shouting woke up the inhabitants of the cottage whence it proceeded, promising to reward them liberally if they would only show us our way back. Three of them consented to do this, and provided themselves accordingly with pine-torches, wrapped round with bracken and leaves. One, a very fine man dressed in white, with his arm extended above his head, bearing the light, led the way; another walked in front of my horse, while the third brought up the rear. They conducted us down the most frightfully steep paths until we had descended beneath the clouds, when the light from our torches threw our shadows in gigantic form upon the mists above, reminding us of the legend of the "Spectre of the Brocken." At last the torches began to go out, one by one; and just as the last light was expiring we arrived at a small village, where we of course found that everybody was asleep. After some delay, during which Mabelle and I were so tired that we lay down in the street to rest, more torches were procured and a fresh guide, who led into the comparatively good path toward Puerto Orotava. Finally, half an hour after midnight, we arrived at the house of the Vice Consul, who had provided refreshments for us, and his nephew was still very kindly sitting up awaiting our return. But we were too tired to do anything but go straight on board the yacht, where, after some supper and champagne, we were indeed glad to retire to our berths. This was at 3.30 a.m., exactly twenty-nine hours since we had been called on Friday night.

It is certainly too long an expedition to be performed in one day, tents should be taken, and arrangements made for camping out for one, if not two nights; but, in the case of such a large party this would have been a great business, as everything must be carried to so great a height, up such steep places, and over such bad roads. Still, there are so many objects and places of interest, not only on, but around the Peak, that it is a pity to see them only when hurried and fatigued."

HUNTING THE MOOSE.



HERE are three modes of hunting the moose, termed still-hunting, fire-hunting, and calling. There was another mode, which legislation has in a great measure suppressed. I refer to the wholesale slaughter of the animals when the deep-lying snows of a protracted winter imprisons them in their yards, and renders them only a too easy prey to the unprincipled butchers who slay them for the sake of their skins. As the snow gets deep, many deer congregate in the depths of the forest, and keep a place trodden down, which grows larger as they tramp down the snow in search of food. In time this refuge becomes a sort of "yard," surrounded by unbroken snowbanks. The hunters then make their way to this retreat on snow-shoes, and from the top of the banks pick off the deer at leisure with their rifles, and haul them away to market, until the inclosure is pretty well emptied. This is one of the surest methods of exterminating the deer.

To be successful in still-hunting, or creeping upon the moose, necessitates the aid of a skilful Indian guide; very few, if any, white men ever attain the marvellous precision with which an Indian, to whom the pathless forest is an open book which he reads as he runs, will track to its death an animal so exceedingly sensitive to the approach of man. This gift, or instinct, seems born with the Indian, and is practised from his early childhood. It is not uncommon to find little Indian boys in the forest several miles from the wigwam, armed with a bow and arrows, the latter having old knife-blades inserted in the heads.

The finely-modulated voice of the Indian is especially adapted to imitate the different calls and cries of the denizens of the forest, and with a trumpet of birch bark, he will imitate to the life the plaintive low of the cow-moose, and the responsive bellow of the

bull. Early morning, twilight, or moonlight are all favourable to this manner of hunting. The Indian, having selected a favourable position for his purpose, generally on the margin of a lake, heath, or bog, where he can readily conceal himself, puts his birchen trumpet to his mouth, and gives the call of the cow-moose, in a manner so startling and truthful that only the educated ear of an Indian could detect the counterfeit. If the call is successful, presently the responsive bull-moose is heard crashing through the forest, uttering the blood-curdling bellow or roar, and rattling his horns against the trees in challenge to all rivals, as he comes to the death which awaits him. Should the imitation be poor, the bull will either not respond at all, or approach in a stealthy manner and retire on discovery of the cheat. Moose-calling is seldom attempted by white men, the gift of calling with success being rare even among the Indians.

Fire-hunting, or hunting by torchlight, is practised by exhibiting a bright light, formed by burning bunches of birch bark, in places known to be frequented by moose. The brilliant light seems to fascinate the animal, and he will readily approach within range of the rifle. The torch placed in the bow of a canoe is also used as a lure on a lake or river, but is attended with considerable danger, as a wounded, or enraged moose, will not unfrequently upset the canoe.

Still-hunting can be practised in September, and all through the early winter months, until the snow becomes so deep that it would be a sin to molest the poor animals. The months of September and October are charming months for camping out, and the moose are then in fine condition, and great skill and endurance are called for on the part of the hunter. The moose possesses a vast amount of pluck, and when once started on his long, swinging trot, his legs seem tireless, and he will stride over boulders and windfalls at a pace which soon distances his pursuers.

HISTORY OF THE GUILLOTINE.



THE popular impression that the guillotine which played such a fearful part in the slaughterings of the French revolution was the first engine of its kind, is quite false; and it is surprising how, in the face of facts certainly well known to historians, such an error should ever have become so generally diffused.

In a visit which we paid some years ago to the city of Aberdeen we were favoured with a sight of the relics of a similar instrument of decapitation, known as the *maiden*, and which had undoubtedly performed sanguinary service in the stormier days of Scottish history. Several years ago, too, we remember having examined, with some excitement of feeling, a machine of the same construction and name, now in the collection of the Society of Scottish Antiquaries at Edinburgh. In 1774 Mr. Pennant, when publishing an account of his tour in that year, states that he saw this identical *maiden* in a room under the parliament house at the Scottish capital, and he ascribes its fabrication to the regent Morton, who copied it from a model which he met with in passing through Halifax. Little did that Scottish nobleman think that his own head was to fall beneath its trenchant blade! Thirty years earlier, than the publication of Pennant's work, the execution of the Scotch lords for the rebellion of 1745, by the axe and the block, seems to have recalled the forgotten *maiden* to notice; for in the "London Magazine" of April, 1747, a pictorial representation of it is given. The last victims of this death-engine were the Marquis of Argyle, in 1661, and his son, the earl, in 1685—the latter quaintly enough declaring, as he pressed his lips on the block, that it was the sweetest *maiden* he had ever kissed.

Antiquated and obsolete, however, as were these instruments of decollation at the period of the reign of terror, the annals of England furnish a still more ancient specimen in the *Halifax gibbet*, as it was termed, which was indeed a perfect guillotine, and had been of old employed in certain peculiar cases in the district that gave it the designation by which it is known. As early as 1650 a print of this machine was produced by John Hoyle, in which it was represented as mounted on a stone pedestal. It is singular that, although the gibbet itself has long ceased to exist, yet the accuracy of the representation has been attested by the recent discovery of this identical pedestal or stone scaffold, it having been long buried beneath an accumulation of rubbish and soil which had formed a grassy mound, commonly supposed to be a natural hill. The town trustees having, however, a few years since, purchased the Gibbet-hill, and having determined to reduce it to the level of the surrounding fields, this curious relic of antiquity was brought to light. The ancient axe is still in the possession of the lord of the manor of Wakefield.

Numerous other illustrations of the early use of the guillotine are collected by the author of the work before us, from which it appears that this mode of inflicting capital punishment has been resorted to in Italy, in Ireland, and even among the Romans. There are engravings and wood-cuts of the sixteenth century extant, which represent guillotines of great elaboration, as having been employed in times of antiquity. In Cranach's wood-cuts of the "Martyrdom of the Apostles," for instance, printed in Wittenberg in 1539, there is an exhibition of the death of S. Matthew by the guillotine, with a legend to the effect that "his head was chopped off by a falling axe, after the manner of the Romans." In explanation of the latter phrase, it may be stated that

the frontispiece of Mr. Croker's, "History of the Guillotine" contains a representation of the death of Titus Manlius by means of a massive and highly-finished guillotine, which has been reproduced from some old German print. Nor is this terrible destroyer totally unknown to the earlier epochs of French criminal history, since we learn that the great marshal de Montmorenci was beheaded at Toulouse, in 1632, by means of such an instrument. From these facts we may safely conclude "that this mode of execution was common on the continent, in the sixteenth and seventeenth centuries, and especially in cases of persons of rank and distinction.

It is equally clear, however, that the knowledge of this method of decollation had passed into general oblivion at the beginning of the French revolution. A considerable interval elapsed between the occasion when the subject was first mooted by Dr. Guillotin and the period when the grim decapitator assumed physical shape and proportions, and commenced its career of carnage. There was for some time a general repugnance to entertain and discuss the question—a sort of instinctive dread of all responsibility in the fabrication of the bloody thing, which contrasts strangely with the horrid and disgusting familiarity that was afterwards manifested towards its ruthless operations. It is probably known to most of our readers that the unfortunate man whose name it bears was in no sense the inventor or fabricator of the instrument; nor was the guillotine originally designed with any view to what subsequently became the source of its infamy—the great number of victims that it could dispose of in a short space of time. On the contrary, it is a curious fact that this blood-thirsty implement was at first proposed on a combined principle of justice and mercy. The law, in cases of capital punishment, only demanding the death of the culprit, it was contended by men of philanthropic views, that a mode of execution ought to be adopted that would be instantaneous, and free from the infliction of all unnecessary

suffering. Such was the plea that gave birth to the ill-omened guillotine.

Foremost among the philanthropists and liberals of the time was Doctor Guillotin, who, though a person of very moderate ability, was so recommended to the *Tiers Etat* by his popular pamphlets (one of which, by-the-by, is said to have been the production of a certain lawyer who was ashamed to acknowledge its paternity), and by the censure of the parliament, that he was elected a representative of Paris to the National Assembly. On this body transferring its sittings from Versailles to Paris, Dr. Guillotin, in order, it is alleged, to ingratiate himself with his constituents, brought forward a series of propositions on crime, criminals, and the mode of punishment; among which was one to the effect that, in all cases of execution, one uniform method should be employed, namely, "by means of a *machine*." These propositions were adjourned without a debate; but about two months afterwards, the pertinacious doctor brought them forward again, with little better success. The debate on this second occasion was brought to a sudden conclusion by an inadvertence of Guillotin himself, who, after representing hanging as an exceedingly tedious and torturing process, exclaimed in a tone of triumph, "Now with my machine, I strike off your head in the twinkling of an eye, and you never feel it." A general laugh, we are told, terminated the debate; "and amongst the laughers there were scores who were destined to be early victims of the yet unborn cause of their merriment."

"Though Dr. Guillotin had talked so peremptorily and indiscreetly about *his machine*," says our authority, "it does not appear that he had as yet prepared even a model, and it is nearly certain that he had no concern in the actual construction of the instrument that was eventually adopted, but to which, while yet in embryo, this unlucky burst of surgical enthusiasm was the occasion of affixing his name." This unfortunate phrase was seized upon and made the subject of a song, which soon

became popular with the Parisians, and thus by anticipation gave an unchangeable appellation to the instrument, which had not until three years afterwards an actual existence. The designation of *Guillotin*, thus arbitrarily conferred, stuck, as the phrase is, in spite of an attempt subsequently made to call it the *Louisian*, after M. Louis, the secretary of the College of Surgeons, who did actually preside over the construction of the machine, which Guillotin had only indicated.

After frequent and protracted discussions on the subject of capital punishment—in which it is remarkable that Robespierre strenuously opposed the shedding of blood in any possible case, or under any pretext whatever—the new penal code was adopted. Two of the articles embodied in it were to the effect that “the punishment of death should consist in the mere deprivation of life, and no kind of torture to be inflicted on the condemned,” and that “every person condemned should be beheaded.” Still, singularly enough, no provision was made for the *mode* of decapitation, until a case occurred in the early part of 1792 that necessitated some decision in the matter. A person of the name of Pelletier was condemned to death for robbery and murder. The perplexed magistrates inquired of the minister how the sentence was to be executed. After the delay of a month, the minister was obliged to have recourse to the Legislative Assembly for instructions. In the official letters addressed to the assembly, references are made to difficulties felt and expressed by the executioners in carrying out the intentions of the new law. An essay on this point is in existence from the hand of M. Sanson himself, the chief and hereditary executioner of France, and who has gained such a dreadful immortality by the part he took in the horrible tragedies of the guillotine, our readers may not be sorry to see a portion of it, if it be only as a literary curiosity.

“In order that the execution,” wrote Sanson, “may be performed according to the intention of law (simple deprivation of life),

it is necessary that, even without any obstacle on the part of the criminal, the executioner himself should be very expert, and the criminal very firm, without which one could never get through an execution by the sword, without the certainty of dangerous accidents.

After one execution, the sword will be no longer in a condition to perform another; being liable to get notched, it is absolutely necessary, if there are many persons to execute at the same time, that it should be ground and sharpened anew. It would be necessary, then, to have a sufficient number of swords all ready. That would lead to great and almost insurmountable difficulties.

It is also to be remarked that swords have been very often broken in executions of this kind. The executioner of Paris possesses only two, which were given him by the *ci-devant* parliament of Paris. They cost 600 livres (£24) apiece.

It is to be considered that, when there shall be several criminals to execute at the same time, the terror that such an execution presents, by the immensity of blood which it produces, will carry fright and weakness into the most intrepid hearts of those whose turn is to come. Such weaknesses would present an invincible obstacle to the execution. The patient being no longer able to support himself, the execution, if persisted in, will become a struggle and a massacre.”

After several paragraphs, characterized by the same decency in handling a very delicate subject, M. Sanson concludes with the following appeal:—“It is therefore indispensable that, in order to fulfil the humane intentions of the National Assembly, some means should be found to avoid delays and assure certainty, by *fixing* the patient so that the success of the operation shall not be doubtful. By this the intention of the legislature will be fulfilled, and the executioner himself protected from any accidental effervescence of the public.—CHARLES HENRY SANSON.”

It is evident enough, from the silence of this document on the subject, that no idea

of employing a machine had found any favour at that period. Guillotin's proposition had been smothered by ridicule, and no one cared to incur the disrepute of advocating it. The urgent application of the minister of justice, however, now brought the matter to a crisis. The question was referred to a committee, who themselves consulted M. Louis, and authorized him to draw up a report, which was adopted by the committee and presented to the assembly. The legislature, on the day of presentation, decreed that the mode of execution thus recommended—decapitation by means of some invariable mechanism—should be adopted throughout the kingdom. No notice, in these proceedings, was taken, of Dr. Guillotin, who, indeed, had retired into more than his original obscurity. Many have supposed that he perished by his own instrument, but this is not the case; though it appears that he was imprisoned during the Reign of Terror—his crime being, it is said, that he evinced an indiscreet indignation at a proposition made to him by Danton to superintend the construction of a triple guillotine. He was afterwards released, and lived in moderate circumstances at Paris, "esteemed, it is said, by a small circle of friends, but overwhelmed by a deep sensibility to the great, though we cannot say wholly undeserved, misfortune which had rendered his name ignominious, and his very existence a subject of fearful curiosity. He just lived to see the Restoration, and died in his bed, in Paris, on the 26th of May, 1814, at the age of seventy-six."

M. Louis's proposition having been adopted, the next step was to prepare a model and an estimate of the expense of constructing the machine. This work fell to the lot of one Guidon, who calculated the cost at about £226; and, when remonstrated with on the exorbitancy of the charge, he justified it on the plea of the enormous wages demanded by his workmen, "from a prejudice against the object

in view." Other contractors, however, were willing to undertake the odious task at moderate charges, on the condition that their names did not appear in connexion with the unpopular instrument. Meanwhile, a pianoforte maker named Schmidt, who had already been employed to construct a somewhat similar machine for provincial use, offered to supply one after the model, for £38, an offer which was accepted; so that Schmidt became, in fact, the inventor and constructor of the instrument that was finally adopted. One having been made for the capital, the local authorities in the departments began to clamour for their respective machines, with a savage eagerness of which many had soon to repent in tears and blood.

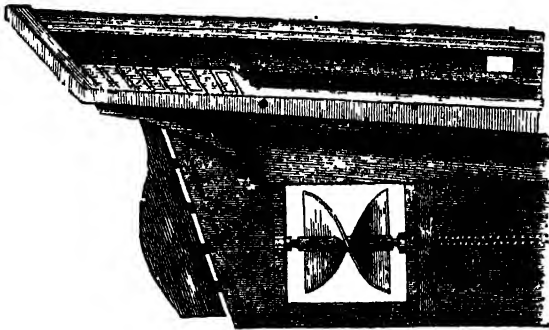
The first victim of this bloody monster, after several experiments had been made with dead bodies, was the wretched Pelletier, whose case had led to all these proceedings, and whose decapitation was a sort of signal for a host of others. Three months afterwards there was an imperfect execution, arising from the swelling of the wooden grooves of the instrument, which excited public disapprobation, and led to the substitution of metal grooves. Immediately after this came the memorable *tenth of August*, when the guillotine, as a sort of "massacre-made-easy," fell into the hands of political factions, and was mercilessly employed in the perpetration of deeds of sanguinary vengeance. The king was among the earliest victims of this greedy destroyer. Instead of being occasionally set up, it was soon established in permanence, and hundreds, nay thousands of heads fell beneath its murderous blade. Among the noblest and fairest of its slain were Marie Antoinette, Madame Elizabeth, Madame Roland, and Charlotte Corday; but we would not dwell unnecessarily upon the crimes of an epoch, perhaps the darkest in human history. We earnestly hope, for the sake of humanity, that the world may never see their like again.

A FORTUNATE ACCIDENT.

THE SCREW PROPELLER.

IT is a wonderful sight to see the big war-ships cleaving their way through wave and tide without the application of any visible force—moving like phantom vessels, the observer knows not how or why, unless he has previously been made acquainted with some of the mysteries of the Archimedean Screw. Now, it is concerning this self-same screw of Archimedes that we shall record the particulars of an accident, and what came of it.

Once upon a time, and not a very long time ago either, there lived a gentleman somewhere in the county of Middlesex, by occupation a farmer, yet, curiously enough, endued with great love for things which do not concern farmers at all. Instead of filling his house and farm-yard with models of ploughs and carts and thrashing machines, and other things which appertain to farming, this gentleman took a fancy to certain objects which people said did not concern him at all. One of his weaknesses was, a hankering after models of ships; in



POSITION OF SCREW.

addition to which taste, he conceived a most unaccountable liking to screws. Anything like a screw brought before his eyes would rivet him as firmly to the spot as a tenpenny nail. A screw was a perpetual solace to him—especially a corkscrew; yet he was not given to use the corkscrew for its usual purpose—to draw corks, but he applied it to the strangest purpose imaginable; he would sit boring a corkscrew into a basinful of water as if he would seemingly *screw the water out*. Then he would take up the model of a little boat, look it over, and under, and everywhere; after which he would throw down the model of the boat, and take to boring the water again with his corkscrew.

"There's a screw loose here," we may

fancy some neighbour muttering, when he called one fine day on our experimenter and caught him water-boring as usual. "There's a screw loose here;" and we may guess the sage utterer of this remark compassionately pressing the forefinger of his right hand to his forehead as an indication of the want in the cranium of his friend that prevailed there.

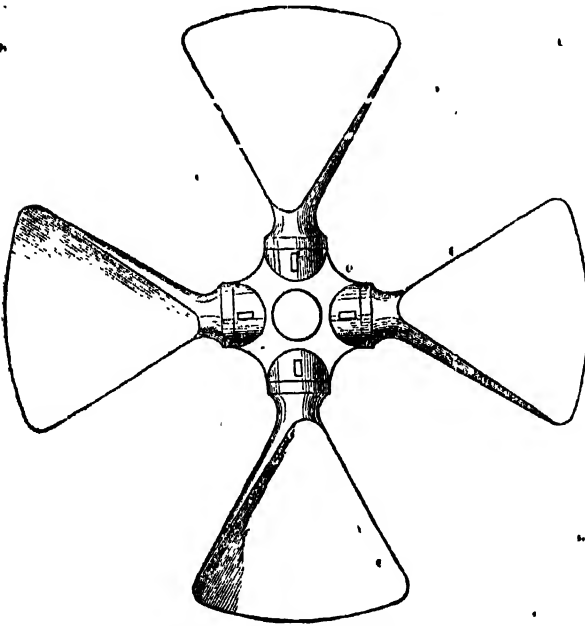
Screws, screws, screws still continued to accumulate on the premises, and now the screws began to assume a peculiar modification. Their threads, instead of being rounded like the threads of an ordinary cork-screw, were flattened very much like the screw-thread of some new-fashioned cork-screws we have seen, and also like the screw part of new-fashioned rapiers.

Moreover, a long axis or spindle ran through the whole length of our friend's screws, in such manner that they could be readily attached at either end, and made to revolve like a wheel.

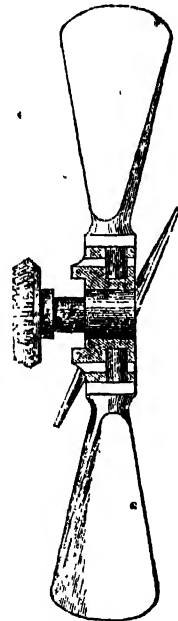
Just as the farmer's neighbours were possibly beginning to think that his love for screws was a pure aberration of reason, a purpose began to shine through his meditations, and one by one his ship and boat models were each furnished with a screw. The reason for doing this was obvious: he meant to force his models

through the water by the motion of a screw instead of the motion of oars or paddle-wheels! Let us now attentively follow the inventor throughout his subsequent investigations, contented to regard him in a somewhat better light than an insane enthusiast in the matter of unmeaning screws.

Let us at our leisure take a passing glance at his screw models. First in order we have model No. 1, in which a long screw, the whole length of the keel, is attached. Well, there it goes! No. 1 has been put into a tub of water, and the artist



A FOUR-BLADED SCREW.



SIDE VIEW.

having wound up a clock-work representative of a steam-engine, and thus set the model screw-boat in motion, it cuts through the water. Well, No. 1 is a clumsy fellow any how. The experimenter lavishes no praise on it, but contents himself with just showing it to us: nothing more.

Now comes No. 2 for examination: No. 2 is a very funny specimen of a boat-model, having a screw on each side. A very clumsy fellow is No. 2.

But funniest of all is No. 3, which the mechanician now sets before us. We burst

out laughing at No. 3. Fancy a little boat with a long cork-screw poking out behind, where the rudder ought to be; the screw spinning round and round, and pushing the craft on by means of this self-same spinning motion. Fancy this, reader, and you will have some notion of No. 3. Yet this boat, having the long screw sticking out behind, is evidently the pet of the inventor.

"I have great hopes of *that* fellow," he says. "He is my man."

"But," remarks some one, "if that notion is ever brought to bear—if ever the screw

be made to take the place of a paddle-wheel, and if the screw is to be fixed behind, as in No. 3, tell us what you will do with the rudder?"

"Ah! that is somewhat of a poser," we fancy we hear him replying, and looking grave as he does so, and scratching his ear. "But," continues he, after a pause, "I hope to be able to make the length of that screw so short that it shall be far less inconvenient than we have it now in No. 3. Perhaps I shall be able to shorten it enough to admit of its fitting in between the dead-wood, or after-run of a vessel, and the rudder."

"Then, in diminishing the length of the screw, you diminish its propulsive force?"

"Of course I do."

"And you diminish the propulsive force proportionately to the length of screw removed?"

"Well, that remains to be proved."

But the curious thing was this. Turn after turn the inventor curtailed the lengths of his screw-propellers, and then setting his models in action, he discovered that their velocity was not impeded. Piece by piece, turn by turn, off came portions of the screw-models, until at length the furthest limits of concession were thought to have been attained, when the screw was reduced to a helix of two turns. A model boat, supplied with a propeller of the kind in question, was sent for a trial voyage of scientific discovery on the storm-untroubled bosom of—not the Pacific Ocean—but the Paddington Canal. Bravely she sped her way, not, we are constrained to say, bidding defiance to the perils of waves and tide, for the most gigantesque tempest-billow of the Paddington Canal is unimportant, and the tides of that brown watery expanse, we need not explain to our intelligent readers, are zero or nil.

Along the tranquil surface of the Paddington Canal sped the two-twist screw-propelled model, when all at once her keel—(no, she had no keel)—her inferior aspect, then, grated against something hard. Her crew start with affright, shipwreck is imminent, and, though no breakers are

ahead, and no tempest rages above, and no desolate shores and cannibal savages are to be apprehended, nevertheless a ducking is more than probable, which, even in the Paddington Canal, is no pleasant thing.

Hurrah! the boat is saved, the shoals are passed. The gallant timbers have been equal to the shock. On she goes again! *Goes!* ay, *how* she goes!—faster, much faster, than before, and that we all know is a most unusual consequence of striking against a rock.

Presently, on reaching the end of its voyage, the stern of the model boat was bodily raised out of the water, when the curious fact was revealed that one helical turn of the screw-propeller had been broken off by the accident, and only one remained. Nevertheless, the model boat had sailed all the better for the amputation. We have no intention at the present time of entering upon the why and wherefore of the case; but the fact was exactly as we have announced—the model boat sped her way through the water more rapidly after the loss of one turn of the screw, the turns of which were only two. Henceforth the problem of attaching a propulsive screw conveniently to a vessel, was solved. Henceforth the screw would fit into the merest slit, and there was space quite large enough for it between the after-run of a vessel and the rudder. Such is the position in which we now find it.

The inventor began now to fly at higher game. No longer content with trying his experiments by small models on the Thames and Paddington Canal, he caused a ship to be built—the little *Archimedes*—and attached to her a one-turn screw. She was sent to sea, and answered admirably. Thus the problem was finally solved, and an accident, to use the common term (for, in reality, nothing is accidental), had a large share in its solution. Let us now reflect on a few of the advantages possessed by the screw-propeller over the ordinary paddle-wheels, and more especially in relation to ships of war.

When first steam locomotion was applied

to vessels by means of paddle-wheels, people began to speculate on the possibility of adapting the invention to ships of war. Adapted it soon was, as the reader need not be informed; but paddle-propelled ships of war laboured under great disadvantages. Firstly, their paddle-wheels were exposed to shot and shell, which might shatter them at any instant, and render them helpless. This was so great a disadvantage, that naval architects despaired of ever being able to apply steam as a propulsive force for war ships in general. It might serve, they argued, for frigates and smaller vessels, to be employed on special services, such as the carrying of despatches or the towing of other ships in or out of action, but here the services of steam would end. Secondly (and this is a graver objection than the last), a ship cannot have paddle-wheels and a full battery of guns. Give propulsive force by means of the paddles, and a ship's broadside is gone. Accordingly all our paddle-propelled ships of war place little reliance on their diminished broadside batteries. They depend on a few long pivot guns, useful enough in their way, but unadapted for action at close quarters. As to ships of the line, broadside batteries they must have, come what will. Hence paddle-wheels for them are an impossibility.

The screw offers no such disadvantages. It occupies no space in the architecture of a ship that could be applied to any other useful purpose. It is completely under water, and therefore entirely out of the reach of hostile shot and shell. It does not materially interfere with the sailing of a ship, whereas paddle-wheels interfere with the sailing qualities of a vessel so considerably, that when not actually set in motion by steam they are a drawback and an impediment.

Perhaps some of our readers would like to know what the curtailed screw of Archimedes resembles. Why, it is not a screw at all, in any sense of the word—it is a mere flat vane. It is something like the

tail of a fish cut very short off, twisted a little in reverse directions, and mounted on a spindle. At first these so-called screws were made of iron, but that material did not answer at all, and they are now made of gun or bell metal. We might say a great deal more about the Archimedean screw—how the exact degree of twist that should be given to it is a point not yet determined; how theorists averred that one of these screws, mounted astern, would interfere with the power of steering a vessel. All this might we say, and a good deal more to the purpose; but we pause.

We have thus, with very little aid from fancy, detailed the mode in which one of the greatest inventions of the age reached completion. A pension of two hundred pounds per annum was deservedly awarded to Mr. Francis Pettit Smith for his patriotic labours.

‘The soundness of this principle has just received further confirmation in the case of one of the latest additions to the Royal Navy. In reporting its trial trip the *Daily Telegraph* says,—“There is in the British Navy at the present moment, it appears, a man-of-war capable of steaming no less than twenty-one miles an hour. She is no torpedo-launch, or steam pinnacle, but a vessel of nearly four thousand tons measurement, having a nominal speed of seven thousand horse power. She is named the *Iris*. No doubt, when fully equipped and armed, she will not be so fleet as she is now; but, on the other hand, the surprising speed that was realized on her trial trip at Portsmouth by this new addition to the Navy is not considered the maximum that the *Iris* is actually capable of making. A previous trial of the ship's engines had not been so satisfactory. At that time a huge four-bladed screw was fitted, and ‘the improvement in the fleetness of the vessel has been due to little else than reducing the surface of the screw, and employing two blades instead of four. In a word, the engines, powerful as they are, had been overweighted by the screw.”



A MONUMENT WITH A STORY.

ANY times (says an American writer) have I heard English people say, as if they really pitied us: "Your country has no monuments yet; but then she is so young — only two hundred years old — and, of course, cannot be expected to have either monuments or a history." Yet we have some monuments, and a chapter or two of history, that the mother-country does not too fondly or frequently remember. But I am not going to write now of the Bunker Hill monument, nor of the achievement at New Orleans, nor of the surrender of Lord Cornwallis at Yorktown. I want to tell of another land nearer its infancy than ours, with a history scarcely three-quarters of a century old, but with one monument, at least, that is well worth seeing, and that cannot be thought of without emotions of loving admiration and reverence. The memorial is of bronze, and tells a story of privation and suffering, but of glorious heroism, and victory even in death.

Everybody knows something of the great island, Australia, the largest in the world, reckoned by some geographers as the fifth continent. I might almost have said its age is less than one-quarter of a century, instead of three. It was visited by the great adventurer, William Dampier, about the year 1690, and again, eighty years after, by Cook, on his first voyage around the world. It is only within the present generation that we have come to know it well. England's penal colony there, and Cook's stories of the marvellous beauty and fertility of the land, were never wholly forgotten; but almost nothing was done in the way of exploration, especially of the interior, and the world remained ignorant

of both its extent and its resources until 1860, in August of which year two brave-hearted young men, by name Burke and Wills, determined to find out all that they could of the unknown central regions. It is in memory of these men that Australia's first monument has been erected. Let us tell you their story.

Burke was in the prime of life, a strong, brave man, who delighted in daring and even dangerous exploits. Wills, an astronomer, was younger, and not so ardent, but prudent, wise, sagacious, and thus well fitted to be the companion of the adventurous Burke. Their object was to trace a course from south to north of Australia, and explore the interior, where hitherto no European had set foot.

Fifteen hardy adventurers were induced to form the little company; twenty-seven camels were imported from India for carrying the tents, provisions, and implements needed upon such a journey; a fifteen-months' supply of provisions were laid in, and large vessels were provided for holding ample stores of water, whenever the route should lie through arid regions.

Thus burdened with baggage and equipments, the explorers started out. Their progress was necessarily slow, but the greatest difficulty with which the leaders had to contend was a spirit of envy and discontent among their followers. This led to an entire change in Burke's plans, and perhaps also to the sad catastrophe which ended them.

Instead of keeping his men together, as at first intended, he divided the company into three squads. Assigning the command of two of these to Lieutenants Wright and Brahe, and leaving them behind at an early stage of the journey, together with most of the baggage and provisions, Burke took Wills, with two others of the most resolute of his company, and pushed boldly forward, determined to reach the northern coast, if

possible, but, at any rate not to return unless the want of water and provisions should compel them.

A place called Cooper's Creek, about the centre of the Australian continent, was to serve as a rendezvous for the entire company; one of the squads was directed to remain at this point for three months, and longer, if practicable; another squad was told to rest a while at Mehindie, and then join the first; while Burke, Wills, Gray, and King were to prosecute their journey northward, do their utmost to accomplish the main object of the expedition, and return to Cooper's Creek. Had this plan been faithfully executed, all might have gone well. But hardly had Burke taken his departure when quarrels for pre-eminence broke out among the men he had left behind; then sickness and death thinned the ranks and disheartened the survivors, and they failed to carry out the programme Burke had laid down. Wright stayed at Minindie until the last of January before setting out for the rendezvous; while Brahe, who had charge of most of the provisions, instead of remaining for three months at Cooper's Creek deserted that post long before the time arranged, and left behind neither water nor provisions.

In two months Burke and his companions reached the borders of the Gulf of Carpentaria, at the extreme north of the continent, having solved the problem, and found a pathway to the North Pacific. Then, worn and weary, they set out to return. Their forward march had been exhausting, as the frequent attacks of bands of savage natives and the many deadly serpents had made it dangerous to halt for rest either by day or night. The heat, too, was excessive, and sometimes for days together the travellers were almost without water, while but sparing use could be made of the few provisions they had been able to carry. Feeling sure of relief at Cooper's Creek, however, and jubilant at their success, the four almost starving men turned about and pressed bravely on, but they arrived only to find the post deserted, and

neither water nor provisions left to fill their pressing need.

In utter dismay they sat down to consider what could be done, when one of the party happened to see the word "dig" cut on the bark of a tree, and digging below it they found a casket containing a letter from Brahe, which showed that he had left the post that very morning, and that our travellers had arrived just *seven hours too late!*

Imagine, if you can, how terribly tantalizing was this news, and how hard it must have seemed to these heroic men, after having suffered so much, braved so many dangers, and tasted the first sweets of success, to die of starvation just at the time when they had hoped relief would be at hand,—to be so nearly saved, and to miss the certainty of rescue by only a few hours! Eagerly they searched in every direction for some trace of their comrades, and called loudly their names, but the echo of their own voices was the only answer. As a last effort for relief, they attempted to reach Mount Despair, a cattle station one hundred and fifty leagues away, but they finally gave up in complete discouragement, when one more day's march might have brought them to the summit and saved their lives.

For several weeks these brave fellows fought off their terrible fate, sometimes hoping, oftener despairing; and at last, one after another, they lay down far apart in the dreary solitude of the wilderness, to die of starvation.

All this and more was learned by Captain Howitt, who commanded an expedition of search sent out from Melbourne some nine months after the departure of Burke and his company, not a word of news having been received concerning them, and many fears being felt for the safety of the little band. On Howitt's arrival at Cooper's Creek he, too, found the word "dig," where the four despairing men had seen it; and beneath the tree was buried, not only the paper left by Brahe, but Burke's journal, giving the details of the journey to the

coast, discoveries made, and the terrible last scenes.

At every step of Burke's pathway new objects of interest had elicited his surprise and admiration. Not only were there fertile plains and beautiful flower-dotted prairies, but lagoons of salt water, hills of red sand, and vast mounds that seemed to tell of a time when the region was thickly populated, though now it was all but untrod by man. A range of lofty mountains, discovered by Burke in the north, he called the Standish Mountains, and a lovely valley outspread at their foot he named the Land of Promise.

But, alas! great portions of Burke's journey had to be made through rugged and barren regions destitute of water, and with nothing that could serve as food for man or beast. Driven to extremities by hunger, the pioneers devoured the venomous reptiles they killed. All their horses were killed for food, and all their camels but two. Perhaps these also went at a later day, for toward the last the records in the journal became short, and were written at long intervals.

Once the party was obliged to halt with poor Gray, and wait till he had breathed his last, when the three mourning survivors went on in silence without their comrade.

A letter from young Wills, addressed to his father, is dated June 29th. The words are few, but they are full of meaning.

"My death here, within a few hours, is certain, but my soul is calm," he wrote.

The next day he died, as was supposed by the last record; though the precise time could not be known, as he had gone forth alone to make one more search for relief, and had met his solitary fate calmly, as a hero should. Howitt, after long search, found the remains of his friend stretched on the sand, and nearly covered with leaves.

The closing sentence in Burke's journal is dated one day earlier than young Wills's letter. It runs,—

"We have gained the shores of the ocean, but we have been aband——"

It is not, of course, known why the last word was never finished. It may have been, that he felt too keenly the cruelty of his companions' desertion of him to bring himself to write the word; or perhaps the death agony overtook him before he could finish it. At any rate, it speaks a whole crushing world of reproach to those whose disregard of duty cost their noble leader's life. It has its lessons for us all.

Burke's skeleton also was found, covered with leaves and boughs that had been placed there, it is supposed, by the pitying natives, who found the dead hero where, in bitter loneliness, he heaved his dying sigh, unflinching to the last.

Howitt wrapped the remains in the flag of his country, and left them in their resting-place. Then he returned to Melbourne, and made preparations for their removal and subsequent burial. They rest now in that beautiful city near the sea, beneath the great bronze monument. There are two figures, rather larger than life: Burke standing, Wills in a sitting posture. On the pedestal are three bas-reliefs, one showing the return to Cooper's Creek, another the death of Burke, and the third the finding of his remains. This is a fitting tribute to the memory of the brave explorers; but a far nobler and more enduring memorial exists in the rapid growth and present prosperous condition of that vast island,—results that are largely the fruit of their labours and devotion.

King survived, but he was wasted almost to a skeleton, and it was months before he could tell the story of suffering he alone knew.



THE

"GREAT EASTERN" STEAMSHIP.



o the bold conception of Mr. Brunel, and the constructive skill of Mr. Scott Russell, the existence of this huge ship is mainly due, and in her structure many principles are adopted which the engineer calls new, but which the student of nature pronounces adaptations of contrivances found in many plants and animals. Most animal organisms commence existence with a simple cell : and this enormous ship is simply a vast cell, containing an assemblage of numerous minor cells. If we made a section right across her centre, we should find that her external casing is double ; exactly as though you were to put a Thames punt inside a Thames barge, keeping them apart by means of iron plates, which together form a wall of cells like a honeycomb. The reason of this is obvious ; a hole may be made in the outer case (the barge) and the water rush in, yet the ship will not sink, because the inner casing (the punt) remains uninjured. We have a somewhat similar structure even in our own skulls. The delicate brain within is defended by a double casing, containing cells of bone. If a blow is received on the head (the outer wall) and the adjacent cells are broken down, the brain is protected by the inner casing, and the person's life is saved. Our brave firemen also have adopted this idea in the formation of the crests of their leathern helmets, so that a brick or beam falling from the top of a house should not injure their heads.

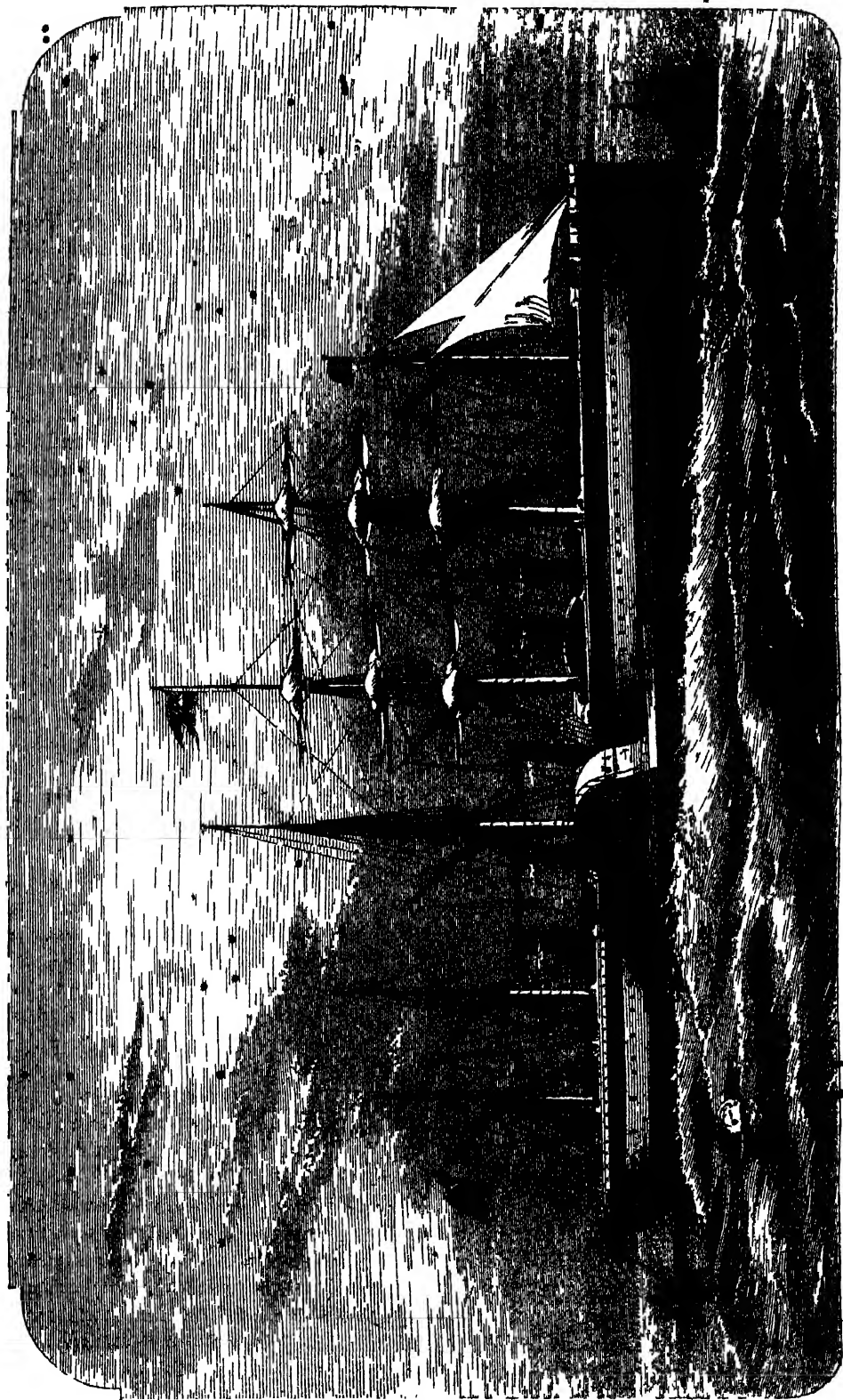
If we make a section of the *Great Eastern*, from stem to stern, we shall again see partitions running across, dividing her

into ten compartments, just as if we divided a wheat straw down the centre, we should see partitions at the knots in it. Any one, two, or three of these compartments may be filled with water, yet the others, remaining sound, will keep her up. We break a wheat straw between two of the knots, and throw it into the water, it does not sink, for the other lengths continue water-tight, and bear it up. It would have been impossible to have built this big ship in one solid piece of iron, as the savage hollows his canoe out of the trunk of a tree. Her sides, therefore, are formed of plates of iron, about ten thousand in number, and each plate had to be cut out and its curve carefully modelled. There are no two plates that have the same curve, so that we cannot but admire the accuracy which has produced a ship of this size as clean in her lines as a small Thames wager-boat. The plates are bolted together with short iron rivets, driven, at white heat, into holes in their overlapping sides, and there clenched. Of these bolts, about three millions have been driven in by blows of the hammer.

If we examine the anatomy of the shell of the common tortoise, we shall find it composed of numerous plates of bone, fitted one to the other, like the iron plates of the *Great Eastern*, except that Nature employs a much neater mode of joining them than the comparatively clumsy plan of riveting.

An interesting description of the ship is given by one who visited it when ready for sea :—

"We are now on board, and, standing at the stern, see a smooth deck before us, 692 feet long, composed of no less than eighteen miles of five-inch planking ; this deck is eighty-two feet across the hull, and 120 at the paddle-boxes. Let our country readers mark out this space with sticks in their newly-mown hay-field, and they will have a



THE ' GREAT EASTERN ' LAYING THE ATLANTIC CABLE .

better idea of her size than mere figures can give. We may tell our London readers that she would not be let down in Grosvenor Square, nor yet in Belgrave Square. Berkeley Square would take her in, if her bows were allowed to project some little way up Davies Street. Portland Place would be but a gutter to contain her, for she could just manage to steam up, scraping with her paddle wheels the houses on each side.

It may be interesting to many to know what comparison the great iron monster bears to Noah's ark. The lamented Hugh Miller, in his "Testimony of the Rocks," states that if the sacred cubit be taken as equal to the length of a man's forearm and hand, the most natural standard, the ark must have been a vessel 450 feet in length, 75 feet in breadth, and 45 in height. Dr. Kitto calculates that it was 547 feet in length by 91 feet in breadth; so that we see before us a structure adapted for floating on the water, positively larger than the ark itself.

Besides her upper deck, the "Great Eastern" has three complete iron decks, towards her bows, and these extend backward 120 feet; they cover 8000 square feet, and afford stowage for 1400 tons of cargo, or a crew of 300 or 400 men. The passenger accommodation is amidships—the best place to go, even in common ships, if sea-sickness is troublesome; the cabins are as large as the parlours of most London lodging-houses, and the sleeping-places are made to fold flat against the wall, so as to afford a pleasant sitting-room in the day time. There is accommodation for 500 first class and 400 second class passengers, or, if necessary, an army of troops. Imagine the flocks of sheep, herds of oxen, sacks of flour, etc., that will be requisite for the commissariat of this floating city, and all this has been duly provided for. In case of it being necessary for this population to decamp from their quarters at a short notice, this mother ship has on board a family of twenty young ships or boats, fitted with masts and sails complete, besides her eldest children, namely, two small screw steamers, each of which is to be 100 feet long by 16

wide, of 130 tons measurement and 40-horse power. In this respect, as well as in her internal construction, she resembles the fresh-water polyp, the hydra, which, if cut to pieces, each piece becomes a separate animal. Break up the *Great Eastern*, and she splits up into several little Easterns, shooting forth at the same time a brood of small but perfect representatives of her former self.

Here, then, we have this enormous vessel, weighing above 12,000 tons: the problem is, how she is to be propelled, cargo, passengers, and all, to Australia and back. What human arms cannot accomplish, human brails perform, by capturing, enslaving, and making to work for them, our sworn enemies, fire and water; the result of their disagreements being strength, almost indefinite, to their master, man.

The heart of the *Great Eastern*, the origin of her life, so to speak, is a steam engine—a Goliath compared to all other engines. We know that when we put a tiny flea under the microscope, it looks as big as a frog. Imagine the engines of a small river steamer also, and we shall have some idea of the relative size they bear to the engines to which we are ordinarily accustomed.

Though apparently one set of machinery, if we anatomize this forest of metal rods, we shall find, not one engine, but four engines, each separate and distinct from its neighbour, and each capable of distinct action, reminding us forcibly of the human heart with its four cavities.

Not only do these engines propel the vessel, but they also do the work of a large staff of sailors. They can heave the anchor, haul the sails, cook the dinner, clean the decks, put out the fire, smother the rats and cockroaches, and scream when anything goes wrong, and they want looking to. No maid-of-all-work ever worked so hard, or will ever work; and yet they do all this without a word of grumbling, provided their joints are well oiled, and their voracious appetites are well supplied with their accustomed preserved vegetable food,

namely, coal—of which their daily rations will be 250 tons, and which they take quite hot, but not smoking hot, because they devour the smoke as well as the fuel, so that, unlike Little Bo Peep's flock, they will not "leave their tails behind them," when puffing along in calm weather.

In the natural creation there are three principal modes of progression: animals walk upon their legs, fish swim by means of their tails, and birds fly with their wings. Our great sea giant will do all three; he will gallop along over the waves with foot-like paddles, as fast as the antelope over the trackless desert; he will scull along with his screw-propeller, swift as a Scotch salmon stemming the boiling mountain stream; or he will spread his white wings to catch the favouring gale, soaring along like the eagle, the monarch of the clouds. What a splendid sight will he be, the embodiment of human engineering skill and human triumph over inanimate things, charging the mountain-like waves of the Atlantic with the force of thirty regiments of Life Guards,* splitting asunder and riding triumphantly upon their broken and foam-covered crests; or else, with twelve thousand square yards of canvas upon six masts, spread to the tropical trade winds, floating along on her homeward voyage like a gigantic pearly nautilus arisen for a time from the coral depths of the vast ocean.

But what bit shall we put in the mouth of this sea horse? what bridle will hold him down in his furious plungings? no less than sixteen anchors, ranging from one ton to seven tons weight each, are attached to upwards of a thousand fathoms of chain cables, all of the most massive description; and thus we have a tether almost strong enough for Archimedes to have tied up the world with after he had moved it out of its place with his lever.

When in full working order, this enormous ship, with its crowd of passengers, cargo, etc., will all be subject to the will

and the orders of one single human being. The captain will be the brain of the ship; his word will direct its movements, regulate its speed, and form its guide over the pathless sea. But he cannot be everywhere, nor is his voice as mighty as it ought to be, if it bore any proportion to his authority. This living brain has a nervous system (so to speak) of copper wires, which extend to its eyes—the men on the look-out; to its heart—the engines; to its stomach—the boilers; and to its hands—the man at the wheel.

Swift as that wonderful but unknown power which enables the human nerves to convey sensation or thought, will the electric spark "pass the word" along the wires, and the message will be delivered almost simultaneously with its setting forth. There will be no shouting, no bawling, no confusion of orders; the lightning is brought from the clouds, and made to write and to talk the language and the will of pigmy man.

The strongest and the wisest man in the world is less thought of at first sight, if arrayed in shabby garments, than if he has a good coat on his back. The proprietors of the *Great Eastern* have accordingly given an extensive order to the ship's tailor to make her a smart outer garment, only the tailor in this case is the painter. To complete his contract, he will be obliged to use more than six tons of paint to give one coat to the interior iron-work, and nearly eight tons to give one coat to the outside, from the water line to the bulwarks.

Thus, then, we have in this gigantic, and, I may say, national undertaking, an example of what man in a high state of civilization can do; we have before us the result of human thought, foresight, and calculation, embodied in a colossal but yet graceful and useful form. Weeks, months, nay, years of hard labour, their allotted duty on this earth, have been expended by thousands of human beings on the construction of this gigantic ship. 'In the sweat of his brow'—his proper destiny—has man called into existence this emblem of peace and of the progress of civilization throughout the whole world."

* The total power of the *Great Eastern* is that of 12,000 horses, and she will go at the rate of nearly twenty miles an hour.

A FEMALE CRUSOE.



ONE of the earliest travellers on the overland route, in search of the north-west passage, was Mr. Hearne, who, during the years from 1769 to 1771, made three several journeys towards the Copper Mine River, in full expectation of finding a northern ocean, the existence of which, it was inferred, would establish the fact of a sea route north of the great American continent. In those long journeys he encountered the most frightful perils and underwent astonishing hardships, not a whit less cruel than the worst of those endured by modern travellers, and he manifested unparalleled fortitude in contending against them. The third journey to some extent established the fact, the verification of which was the chief object of his expeditions, and moreover corrected some important errors in the reports of preceding explorers. But we have nothing to say on that subject here. Mr. Hearne's expeditions have long been a dead letter; and we refer to them only for the purpose of introducing an episode in his adventures which strikes us as affording, perhaps, the most remarkable instance of female resource and self-reliance ever recorded.

When Mr. Hearne, with a company of Indian guides, was travelling in the arctic circle, not far from the Lake Athapuscow, one of the guides came suddenly upon the track of a strange snow-shoe. Astonished at the sight, in a region supposed to be hundreds of miles from any human habitation, the Indians followed up the track, and after pursuing it for some distance, arrived at a small hut or cabin, formed of snow and driftwood, where they discovered a young woman sitting alone. She understood their language, and did not need much persuasion to induce her to return with them to the

traveller's tent. Here, on being interrogated, she told her story; when it came out that she was a native of the tribe of Dogrib Indians, who were, or had been, at feud with the Athapuscans, and that at an inroad of the latter, during the summer of 1770, she had been taken prisoner and carried off to slavery. In the following summer, when the Athapuscan Indians were travelling the country, she watched her opportunity, and, on arriving near the place where she was found, managed one night to give them the slip, intending to find her way back to her own people. In this, however, she was disappointed. She had been carried away in a canoe, and the twistings and windings of the river were so many and intricate, and so often intersected each other, and there were so many lakes and marshes, that she found it impossible to pursue her route. In this dilemma, instead of resigning herself to despair, she set about building a dwelling for a shelter during the winter, and having completed it, she calmly took up her abode and commenced her solitary housekeeping.

She had kept an account of all the moons that had passed; and from this it appeared that for seven months she had not seen a human face, and had subsisted in this desolate region entirely by her own unaided exertions. How had she contrived to sustain life? When asked that question, she said that when she ran away from her captors she took with her a few deer sinews. With these she made snares, and caught partridges, rabbits, and squirrels; she had also killed a few beavers and porcupines, and was not only not in want of food at the period when she was discovered, but had a tolerably good stock of provisions laid up for future use. When the snares made of the deer sinews were all worn out, she was ready with another stock manufactured with sinews drawn from the legs of the rabbits

and squirrels which had fallen victims to her cunning. But this "exemplary female" had not only well stocked her larder by the exercise of industry and forethought, but had also taken equal care of her wardrobe. From the skins of the various animals she had caught she had made up an excellent winter suit, which was not only warm and comfortable, but, according to Mr. Hearne, was put together with great taste, and exhibited no small variety of ornament. "The materials, though rude, were curiously wrought, and so judiciously arranged as to make the whole garb have a pleasing though somewhat romantic appearance." Her working implements consisted of the broken shank of an iron arrow-head, and a few inches of iron hoop roughly sharpened into a knife; and with these she had constructed not only her dress, but a pair of substantial snow shoes, and several other useful articles.

The keeping up her fire had given her most trouble. With two sulphureous stones she could, by dint of violent friction and continuous pounding, raise a few sparks so as to kindle a handful of loose fibres of wood carefully picked small; but the labour was wearisome and long; and to avoid the necessity of it, she had not suffered her fire

to be extinguished for many months. She was never idle. When fatigued with the toils of the chase, or when she was not under the necessity of hunting, she occupied herself in peeling off the thin inner bark of the willow trees with which the spot abounded, and twisting it into a species of twine. Of this sort of line she had already accumulated several hundreds of fathoms in length, and it was her intention to make of them a capacious net for fishing, as soon as the frost should break up and the streams become practicable.

Of this remarkable female, Mr. Hearne, in his journal, says: "She was one of the finest women I have seen in any part of North America." It would seem that his Indian guides were of the same opinion; and that, while they admired her for the comeliness of her person, they were by no means insensible of the value of her multifarious accomplishments. There was not a man among them who did not desire to have her for his wife; so, according to the custom of their tribe, they put her up to competition, and wrestled in the ring for her—the strongest of the party, after he had overthrown all the rest, having her duly assigned to him.

MEMORIES.

GOLDEN memories crowd before me
Of the happy days gone by,
Till they make the head grow dizzy,
And the heart heave many a sigh.

I recall my darling mother,
Teaching my young lips to pray,
Pressing me so fondly to her,
At the close of each bright day.

Ah! those days of careless pleasure
And those nights of gladsome glee,
Waiting at the gate, and watching
Father's coming home to see.

But, alas! a sadder memory
Rises now before my eyes:

First my father, then my mother,
Went before me to the skies.

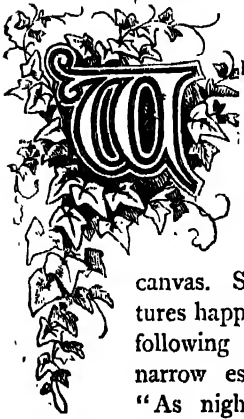
I was left a lonely orphan,
Early taught to earn my bread:
And sometimes I've grown so weary,
I've almost wished that I were dead.

But I know that God my Father
Keeps His promise still the same—
To watch o'er the lone and friendless,
Whilst shall last His glorious name.

So I must not be desponding,
I will trust and hope once more,
And wait till the heavenly summons
Calls me through the pearly door.

A. J. S.
Q

ADVENTURE WITH A COBRA.



WHILE on an excursion to the hills near Bellary, with a large party of servants, Lady Barker with a lady friend passed two nights under canvas. Several exciting adventures happened to them. The following extract relates their narrow escape from a cobra :

"As night came on, we had chairs brought out, and sat at some distance from our encampment talking ; and, though neither of us said so, I think each felt regret in her heart that we had made this expedition at all. I remember the moon was wonderfully beautiful and bright ; so bright that I could read very small type. We tried to talk cheerfully, but the adventure of the wild-cat had impressed us much, and we began seriously to reflect upon our foolishness in undertaking such an expedition alone.

At last the time arrived for us to retire. The two ayahs were with baby, and my old dog Bessie was helping to keep guard, until I went to my charpoy, and relieved them of their charge. In addition to the cocoa-nut oil lamp, which we intended to burn all night, I insisted upon keeping a candle on a chair by my bedside to read by, for I felt strangely wakeful. Baby was very restless when I went to bed, so I sang a long lullaby to her to soothe and send her to sleep. The cocoa-nut oil lamp was burning dimly, and there was very little light in the tent when I put out my candle. The moon was going down, and, as I lay on my charpoy, quiet and silent in the stillness of the night, a feeling of indescribable dread fell upon me—a fear of I knew not what. Not a sound came to me from those around ; my friend Julia scarcely seemed to breathe, so profound was her slumber ;

Bessie was lying stretched at full-length under the table, which was in the centre of the tent, forgetting her cruel treatment by the wild-cat in happy unconsciousness. Tranquil sleep had fallen upon all the other inhabitants of the little camp, I only could not rest ; my eyes seemed strained open, staring at vacancy. I thought of all the tales I had heard of the treachery of natives ; of the fleet and stealthy movements of tigers ; my butler had come to me only the day before, with a tale of two man-eaters which were known to be somewhere within fifty miles ! I had thought little of his account at the time he told me, but now all the histories of the rapidity with which a tiger travels came back to me. I thought of Thugs, of all the horrors of the Indian Mutiny, then but lately passed, until my heart beat and throbbed with such an agony of fear that I could scarcely breathe.

While I was doubting if I should speak to Julia, or call for my ayah, or, in fact, do anything to break the spell under which I was suffering, Bessie suddenly started up and barked, and then looked towards the outer fly, used as a door, which was partly raised. I sat up in my bed and looked out ; the moon was sinking, but had not yet disappeared, and I could see outside the tent distinctly. There was nothing but the shadow of the half-raised fly ; I strained my ears, but could not catch a sound. Then Bessie raised herself from under the table, and came up close to my charpoy, barking short, sharp, complaining barks. She came quite near to me and put her paws upon the bed, and touched my cheek with her cold nose ; then, uttering a whine of entreaty, she rubbed her head upon my shoulder and made me understand that she was troubled. I caressed her, and looked again upon the moonlit scene without ; then I told her to be quiet and lie down ; I was afraid she would wake up the baby, and I

spoke crossly to her, saying there was nothing there. Still, she barked and whined. Julia awoke, and called out to her to be quiet. I said—

‘I am sure Bessie would not be so restless, and disturb us in this way, without reason. I believe there are thieves, or wild-cats, or something of the kind, near us.’

Julia listened, and answered very crossly, ‘You always think that stupid old dog cannot do wrong. You know there are plenty of the servants near, and they were ordered to be on the watch to-night; so do go to sleep.’

‘Listen!’ I pleaded. ‘I am so frightened.’

‘How can you be so childish?’ cried Julia. ‘I declare I am very glad that this is to be our last night in the tent; we won’t try it again.’

‘Oh no!’ I sighed; ‘I wish we never had.’

I tried to be still; I tried to think of other things; I spoke very sharply to my poor Bessie, for she would keep barking and snorting in a perfect fury at some unknown, unseen danger. Again, in spite of my angry words, she came to me and scratched upon the bedclothes. I looked out again; still there was nothing to be seen. I slapped her; she whined and went back to her bed under the table. All this time my little child was sleeping peacefully by my side; I kissed her closed eyelids and then determined to make a great effort to sleep myself. I turned my pillow, and laid my burning head upon the cool side; then I began the old children fashion of counting myself to sleep. It would not do: that dread, that horror, would not leave me. Poor Bessie, too, was evidently as uneasy as before; I heard her breathing hard, and snorting in a short suppressed way, now and then giving a whine of trouble and discontent. I had just resolved to brave the danger, whatever it might be, by getting up, and going to the opening of the tent to look out, when I was started by a loud snarl, followed by a sharp bark from Bessie. I

sat up and looked at her, and I saw she was staring at the ground by the side of my charpoy; the old dog’s lips were curling with rage, her back all bristling, and her eyes starting almost from her head. Leaning over the edge of my bed, I looked down at the spot on which her eyes were fixed, and I saw, in the dim light thrown by the little wick of the cocoa-nut oil lamp, something lying in coils between the chair on which the candlestick was placed, and my charpoy; I saw dusky folds moving and writhing on the ground; and almost touching my face as I stooped down, a flat head reared itself, swaying backwards and forwards with outstretched hood and forked tongue. It was a cobra! Oh, how terribly I suffered at that moment. The chill disgust, the deadly fear, the hatred, I felt for the loathsome reptile, every instant drawing its vile body nearer and nearer to me and my little child, paralysed me for an instant, and in a voice strangely calm, seeming to me, I remember, as if somebody else was speaking rather than myself, I said, ‘Julia, there really is a cobra trying to get into my bed. Scream for them to come.’

‘Do be quiet’ she murmured in a sleepy tone, ‘and go to sleep; you are dreaming: how tiresome you are!’

The hooded head was rising, the forked tongue close upon me, the sickening smell from the snake was in my nostrils. With a loud hoarse voice I shrieked, ‘Oh do, Julia, leave the tent, and send them to me.’ And I screamed one scream after the other.

Julia then sprang up, and rushed out of the tent; and I, reaching over the reptile’s head, and seizing the candlestick, which was on the chair—a heavy plated one with a tall glass shade—dashed it with all my force upon the cobra’s writhing body. The head fell, and, wriggling and twisting in a hideous manner, it glided from me. Butler, maty, and ayahs all rushed in pell-mell, with tent-poles and various other implements of destruction, and soon finished the work begun by the candlestick. Then they displayed the dead body to me with an air of much satisfaction.

I was so terribly frightened that I felt I could not stay another hour in our encampment. My nerves were so shaken that I saw snakes everywhere; and Julia was almost as anxious as I was to be off. The moon was down, and darkness upon everything. My butler, a very wise and trustworthy old man, advised me strongly to wait till daylight; he salaamed many times, and pleaded, 'If missis wait one, two hour, no danger; me and other boys staying by missis, holding lights so as missis can see, and making plenty noise, so no cobra can come. Missis going down hill in dark; plenty more danger coming.' But I was obstinate, and insisted upon continuing our march at once.

Accordingly the bandies were prepared for us to make our descent of the hill; our horses were to remain until daylight, and then to follow us, that we might afterwards proceed on horseback. One pair of our bullocks were steady, good-tempered, well-conditioned beasts, whose conduct we could be certain of; therefore, they of course were fastened to the bandy in which baby travelled. Julia was to go down the steep little hill with my darling in her bandy, while I settled to go in the smaller one with the glass, crockery, etc., and the old dog Bessie. Julia, baby, and her ayahs got into their carriage, and accompanied by some of the natives carrying torches on either side, began their downward march. The road was very steep and winding; on the one side a high bank rose above our heads, and on the other was a sharp and sudden declivity, guarded by a low wall about two feet high.

The first bandy started with its precious freight, and slowly the bullocks planted their sure feet upon the uneven ground. I watched them as long as I could see by the torchlight, and then I, too, mounted into the bandy with Bessie, and prepared to set off; but, as ill-luck would have it, my bullocks, which were not our own, but had been hired for the journey, were, what is called in Madras, bobbery bullocks—bobbery signifying of a diabolical temper, a tem-

per produced, in all probability, by the brutal treatment they too often receive. Goaded and maddened, their tails twisted off, their poor hides blistered and bleeding, perchance one day the idea of revenge has entered their dull brains, and they have suddenly become conscious of their own strength, and determine to use it against their oppressors. At any rate, from whatever cause, my bullocks were very bobbery, more so than was at all expected; for I had no sooner entered the bandy, and the driver got upon the box, than they started off as hard as they could tear. Not content with racing down the proper marked-out road, they, either owing to the darkness or from malice prepense, took a leap over the two-feet wall which formed the boundary of the road, dragging the bandy after them, and then down the rocky and steep mountain-side.

Bump, bump, went the bandy, swaying from side to side, dashing against stones and mounds of earth in its descent. I was up at the top, down on the floor, first half out of one window, then out of the other, Bessie thrown yelping on me, then I on her. Bang, crash, off came the door; then the poor driver was thrown from his seat, and, as I afterwards found, had his leg broken. I was now more entirely at the mercy of the bullocks than ever. All was darkness. I dared not, if I could, have extricated myself from the bandy: I knew not where I was, nor whither going. I heard the cries of my terrified servants above, and could see the flashes of the torches, but I was going down, down, faster and faster every instant; at last there came a fearful shock, and we stopped.

Once feeling the rapid motion was over, I gathered my poor bruised body together, and scrambled out of the damaged bandy, Bessie limping after me. My butler was descending the rugged pass, down which I had just involuntarily come, as fast as his legs and arms could bring him. Meanwhile I stood in the darkness, listening to the snorting and groaning of the prostrate bullocks, afraid to move until he arrived

with his torch. Soon the other boys, as we call them in India, found their way to our assistance; and then we discovered that the infuriated animals had indeed only just stopped in time; they had fallen on their knees, and their heads were almost hanging over a precipice with a drop of at least twenty feet. I had to scramble up the hill as well as I could, and gained the road

again before it was possible to descend. The bullocks were extricated from the shattered bandy, which had to be left in its perilous position for the present.

Arriving at the foot of the hill, I joined my friend Julia and my baby, whom I found in perfect safety. Thankful for our preservation, Julia and I then made a vow that we would never try a tent life again."

THE SYRIAN SHEEP.



HE manner of tending sheep in the East is very different from that practised among ourselves, and supplies many illustrations to the poetry and the parables of Holy Writ. The sheep districts consist of wide open wolds or downs, rest here and there by deep ravines, in whose sides lurk many a wild beast.

During the day the sheep roam at will over a wide extent of common pasture, only kept from encroaching on the territory of another tribe. In the evening they are gathered into folds. These folds are, in most parts of the country, the natural caves or old dwellings of the Horites, adapted for the purpose, with a low wall built outside them, as may be seen in Mount Quarantania, near Jerichó; in the glens near the lake of Galilee, and in the hill country of Judah.

"There are two breeds of sheep," says Canon Tristram, "so far as I could judge from observation in Palestine. In the northern hills there is a breed apparently not unlike the merino, with short fine wool,

well-shaped and fine legs. The common Syrian sheep is much taller, large boned, with a broad flat tail, hornless head (excepting in the rams), and long Roman nose, such as we see represented in Italian landscapes. The peculiarity of this breed, which by some has been distinguished from the common sheep (*Ovis aries*) under the name of *Ovis laticaudata*, is the enormous development of fat on the tail. This is the only race we noticed in the southern parts of the country, and it seems to have been the breed of the ancient Israelites, the fat of the tail being spoken of as the rump."

Both Herodotus and Aristotle especially mention the broad-tailed sheep of Arabia and Syria. The tail is simply a mass of fat, and is used for grease, for lamps, and for cooking. The Arabs fry it in slices, and esteem it a delicacy; but it is very like fried tallow. The enormous development of the tail appears to abstract both flesh and fat from the rest of the body. Though the carcase does not weigh more than fifty or sixty pounds, the tail will average ten pounds, and I have known it fourteen pounds. The horn of the Syrian ram is very large, not spiral, but recurved under the ear.



THE MIRACLE OF SAINT JANUARIUS.



THE firing of a royal salute, as I sat one morning at breakfast in Naples, was in itself an event sufficient to excite my curiosity. I was for a time unable to account for the phenomenon. Summoning the aid of a Neapolitan, I inquired what the cause of all the firing was. To which he replied, with a pitying look for my ignorance, "Eccellenza, il sangue, il miracolo." The truth now dawned on me in full force: it was Saint Januarius' Day; the liquefaction had taken place, and the occurrence of the yearly miracle was announced to the Neapolitan faithful by the salvo I had just heard. Knowing that the miracle would keep, and that the sight of the mysterious liquid, believed, on the testimony of its clerical guardians, to be human blood, and still more that of the saint in question, might be seen with equal advantage a couple of hours after the salute as at the moment of its being fired, I quietly finished my breakfast. Then from Santa Lucia I passed up by the Largo del Palazzo, and, taking a cab from the stand opposite the "Caffe di Europa," fell into a carriage procession, which slowly proceeded along the right margin of the Strada Toledo.

This street, narrow at best, becomes more then ever impassable on all occasions of popular excitement. The carriages are then always present in greater numbers; and this fact, coupled with the practice of allowing newsmen and itinerant traders of all sorts to set up their standings along either side of the street, and even on the side-paths, makes a drive through the Via Toledo a very slow affair. As the train of carriages going up the street keeps the right side, and that coming down the left, there is not the deadlocking and fouling each other that might otherwise be expected; there is, however,

an occasional *contre-temps* when some horse in the middle of the long line takes it into his head not to proceed any farther, and by a sudden halt brings all the others behind him on their haunches, some of them getting contused noses in the operation.

When a driver has been ordered to stop at any particular place, he usually gives notice of his intention by a violent cracking of his whip; a signal pretty generally understood amongst the confraternity. Thus he does not cause more than a moment's delay, and, as the Neapolitan whips all drive well, the lost time is speedily recovered. I must not, however, omit to mention the very frequent falling of the horses, and the confusion occasioned thereby. The fact is, many of the one-horse cabs are drawn by very wretched specimens of the equine race, animals whose sustenance has been principally a rough, coarse, stalky grass, filling at the price, but containing little nourishment. Now, on a diet like this a horse will indeed for a time exist, but that it will constantly draw a cab at the same time is to expect too much; and the consequence is, that the wretched brutes—examples of demonstrative anatomy, or rather of anatomy not needing any demonstration—stumble on the slippery pavement, and, finally falling from sheer weakness, in many instances die there; though they are more frequently whipped by their inhuman drivers until, goaded beyond endurance, they make one or two convulsive struggles, and succeed in recovering their feet. To re-harness the jaded animal is the work of a few minutes, all unemployed coachmen near lending a hand; and when this is finally accomplished, the harness, meanwhile, being tied in several places with pieces of cord, the route is once more pursued. I lately rode in one of these vehicles from the mole to the post-office, and scarcely had we started before the driver came to a sudden halt, owing to one of the traces becoming loose. Dismount-

ing, he commenced a rather discursive search after the tongue of a buckle that had fallen out, and, this found, it was quickly adjusted. I supposed we were now at length all right; but a fallacious hope it proved, as the same accident again occurred shortly after, and necessitated a fresh delay; after which we, with some difficulty and no little apprehension, reached the desired goal in time to anticipate the departure of the Marseilles mail-bags. But I fear some impatient reader will be inclined all this time to regard me as being as discursive in my account of the miracle as the poor cabman was in his search after the missing buckle-tongue.

After some twenty minutes we reached the square open space opposite the Jesuits' College, a building now much more usefully employed for the public as a military hospital. Passing this, it was the work of a few seconds to enter an archway on the same side, and thence to dive into a series of narrow, dirty streets, bounded on either hand by tall, gloomy houses. And now, as but little variety presented itself, I shall take the liberty of hastening at once over the intervening space, and suppose myself arrived at the entrance of the Chiesa di San Gennaro, a spacious edifice, the approach to which is by a flight of stone steps. The entrance is lofty, and the interior of vast extent. Large as this church is, it annually witnesses the assemblage of vast crowds on the 19th of September, to witness the exhibition of the liquefied blood of the patron saint of Naples.

In one such crowd I was soon absorbed, pressing, like those around me, eagerly to the front, in order to have a good view of the evidences of this so-called stupendous miracle. A short time spent in the throng sufficed to show me the utter hopelessness of making my way to the front; so as soon as this fact had painfully impressed itself upon me, I withdrew. Skirting the outside border of the assemblage, I soon neared the eastern extremity of the building, where I found a sentry of the National Guard posted, in charge of an iron wicket opening

into the chancel, a space preserved for the Neapolitan *élite*. On representing to the functionary in question that I was a foreigner, he at once communicated with the officer of the guard, who then kindly gave permission to me and a few other Englishmen to enter. The gate was immediately closed after us, and we were safe from all the unpleasant consequences of being held fast in the centre of a continental crowd.

Pausing for a moment to survey the scene that now met my downward gaze—for I was standing on a platform raised within the chancel—I beheld a mixed multitude densely packed on either side of a barrier of rope, which, being tightly drawn, left a clear space isled off in the centre, to and fro in which were persons passing, as they either went towards or returned from a group of priests standing at the extreme end. Perceiving at once, by this, as well as by the direction thither of the eyes of the multitude on either side, that the chief attraction, and in all probability the miracle itself, was there being exhibited, I resolved to descend from my eminence and make my way towards the spot whither all eyes were so eagerly turned. Leaving the chancel, I proceeded downwards and onwards till I at length reached the clerical group above mentioned.

The most remarkable figures amongst them were two priests, one of whom held a lighted wax candle (for what purpose will be mentioned presently), and the other a pyx, something similar to those in use for holding the consecrated wafer. The pyx in question, however, was formed with the usual radiating border of silver, whilst its centre was hollow, and covered with a crystal front and back. In the interior of this pyx were fixed two bottles; the one long and finger-shaped, the other in form like that of a flattened globe, or modern scent-flask. In each of these was a dark-reddish liquid, apparently of a thick consistency, the fluidity of which was proved by the priest who held it tilting the pyx from time to time on either side, his companion meanwhile holding the wax candle

behind it, in order to prove the reality of its being a fluid that was in the bottle.

As "the faithful" advanced, they knelt before the officiating priests, one of whom pressed the wondrous pyx to the lips, forehead, and breast of each in turn, but merely going through the motions in case of the devotee belonging to the poorer classes, and then passing on to the next in succession. As I did not belong to the same persuasion as the exhibitors, they did not attempt to thrust "religion" on me, but were satisfied with exhibiting the undoubted fluidity of the contents of the pyx, after which I retraced my steps, by no means satisfied that what I had seen was blood, or, still less, human blood, and, least of all, that of Saint Januarius.

Some say the *quasi* miracle is performed by the chemical compound being acted on by heat. It occurred to me, however, that a much simpler solution might be found, in having two pyxes, duplicates, one containing a solid and the other a liquid compound, the former remaining for exhibition all the year round, and the latter presented once a year as its substitute. This would be a mere adaptation of a well-known juggler's trick, often performed with duplicate boxes and bags.

A stranger, in beholding the scene I have described, could not fail to be struck with the awed look of the people present; an impression that the loss of his pocket-handkerchief or cigar-case would afterwards considerably modify.



THE DESTRUCTION OF ARICA.

PROBABLY no earthquake within human experience has spread ruin and death over a wider area than that which devastated Peru and Ecuador on the 13th of August, 1868.

That region of South America was convulsed over a length of not less than two thousand miles. Many towns and cities, both on the coast and inland, were entirely reduced to ruins, and thousands of the inhabitants perished. Along the coastline, beside the destruction caused by the earthquake shocks, great devastation and loss of life were effected by the sea. The waters were observed to retire for several hundred yards, laying bare the beach for that distance; then gathering into a huge angry wave, they rolled in, completing the ruin of the buildings, and sweeping men, ships, boats, houses, furniture, and wreck of all kinds in one promiscuous flood far into the country. Arica, the principal port in the south of Peru, was levelled to the

ground, and its shipping destroyed. As the sea retreated, the vessels were carried out helplessly seaward; when it stopped and grew into a vast wave fifty feet high, which rolled back upon the town, the shipping was swept on, reeling and circling on the water which was bearing it irresistibly to destruction. In a few minutes every vessel was either ashore, or wrecked, or floating bottom upwards. The American man-of-war *Waterloo* was carried about a quarter of a mile inland, and escaped with the loss of only one man. The storeship *Fredonia*, heavily laden with supplies for the American navy, was capsized, losing every one of her crew, except three who happened to be on shore. The Peruvian steam-corvette *America* was driven from her anchors and wrecked, losing sixty of her crew. The British barque *Chanarcillo*, wrecked far up on the beach, lost half of her crew; while an American barque, laden with guano, was swallowed up, and no vestige of her seen afterwards.

At Iquique the destruction caused by the inroad of the sea was appalling. One of



THE DESTRUCTION OF ARICA BY AN EARTHQUAKE.

the sufferers thus describes it: "In an instant the sea moaned and retired hundreds of yards into the bay, leaving all the shore exposed. I saw the whole surface of the sea rise, as if a mountain side, actually standing up. Another shock, accompanied with a fearful roar, now took place. I called to my companions to run for their lives on to the pampa. Too late! With a horrid crash the sea was on us, and at one sweep dashed what was Iquique on to the pampa. I lost my companions, and in an instant was fighting with the dark water. The mighty wave surged, and roared, and leaped. The cries of human beings and animals were dreadful. I knew no more until

I found myself on the pampa, and all dark around me. In the morning I found Iquique gone, all but a few houses round the church."

From the information which has now been collected from all parts of the world, it appears that there is probably no large section of the earth's surface wholly free from earthquakes. Some countries are much more subject to them than others; certain districts are liable to frequent sharp and occasionally destructive shocks; others only experience gentle tremors at wide intervals. It would seem, however, that hardly a day passes without a concussion of some kind being observed in one or more parts of the globe.

FOOTPRINTS ON THE SAND.—A REVERIE.

BEING in rather a serious mood, I strolled alone across the hill, and beheld the sunset. It was indescribably magnificent. I felt cheered, and sat awhile looking at it.

At last my eyes fell upon the pathway at my feet. It was thickly marked with footprints of people passing to and fro. I saw there the heavy footmark of the labouring man, perhaps coming home from a hard day's work, picturing to himself the bright fireside, his smiling wife, and happy children hastening to meet him.

I saw the small soft print of a little child hurrying to school, dreading the teacher's anger, if perchance he happens to be late.

I saw a woman's tread, heavier maybe with a mother's care of providing for her children, and in making both ends meet. And then my fancy led me away, and I saw the lad, with a light footstep, having never a care in his breast, thinking to himself of the bright and happy time when he will shine in the world and be great. And then I saw the man who had seen more of the world, and found how hard it was, and was content to go on quietly without being famed as he had at one time hoped.

Then I saw the man, disappointed and

wearied, who had reached the top of the ladder, and had not found it altogether what he had hoped it would have been. The thousand cares and troubles which weighed daily upon him bent his shoulders, and made him look older than he really was.

Next I saw the old weather-worn pilgrim leaning on his staff; he had fought his way manfully through this world, and was looking forward with a longing confidence to the next.

And I thought how sadly wandering my footprints would look on the sands of time. How few of us could say with the humble confidence of the apostle, "I have fought a good fight, I have finished my course, I have kept the faith; henceforth there is laid up for me a crown of righteousness, which the Lord, the righteous Judge, shall give me at that day: and not to me only, but unto all them also that love His appearing." Then I awoke from my reverie.

"Lives of great men all remind us
We can make our lives sublime,
And, departing, leave behind us,
Footprints on the sands of time.
Footprints that perhaps another,
Sailing o'er life's solemn main,
A forlorn and shipwrecked brother,
Seeing, shall take heart again."

THE COLD SNAP.



IN the extremes of winter and summer, when the weather is either extraordinarily cold or hot, I confess to experiencing a peculiar sense of helplessness and vague uneasiness. I have a feeling that a trifling additional rise or fall of temperature, such as might be caused by any slight hitch in the machinery of the universe, would quite crowd mankind out of existence. To be sure the hitch never has occurred, but what if it should? Conscious that I have about reached the limit of my own endurance, the thought of the bare contingency is unpleasant enough to cause a feeling of relief, not altogether physical, when the rising or falling mercury begins to turn. The consciousness how wholly by sufferance it is that man exists at all on the earth, is rather forcibly borne in upon the mind at such times. The spaces above and below zero are indefinite.

I have to take my vacations as the fluctuations of a rather exacting business permit, and so it happened that I was, with my wife, passing a fortnight in the coldest part of winter at the family homestead in New England. The ten previous days had been very cold, and the cold had "got into the house," which means that it had so penetrated and chilled the very walls and timbers, that a cold day now took hold of us as it had not earlier in the season. Finally there came a day that was colder than any before it. The credit of discovering and first asserting that it was the coldest day of the season is due to myself—no slight distinction in the country, where the weather is always a more prominent topic than in the city, and the weather-wise are accordingly esteemed. Every one hastened to corroborate this verdict with some piece of evidence. Mother said that the frost had

not gone off the kitchen window nearest the stove all the day, and that was a sign. The sleighs and sledges as they went by in the road creaked on the snow, so that we heard them through the double windows, and that was a sign; while the teamsters swung their benumbed arms like the sails of a wind-mill to keep up the circulation, and the frozen vapour puffed out from the horses' nostrils in a manner reminding one of the snorting coursers in sensational pictures. The schoolboys on their way from school did not stop to play, and that was a sign. No women had been seen on the street since noon. Young men, as they hurried past on the peculiar high-stepping trot of persons who have their hands over their ears, looked strangely antiquated with their moustaches and beards all grizzled with the frost.

Toward dusk I took a short run to the post-office. I was well wrapped up, but that did not prevent me from having very singular sensations before I got home. The air, as I stepped out from cover, did not seem like air at all, but like some almost solid medium whose impact was like a blow. It went right through my overcoat at the first assault, and nosed about hungrily for my little spark of vital heat. A strong wind with the flavour of glaciers was blowing straight from the pole. How inexpressibly bleak was the aspect of the leaden clouds that were banked up around the horizon! I shivered as I looked at the sullen masses. The houses seemed little citadels against the sky. I had not taken fifty steps before my face stiffened into a sort of mask, so that it hurt me to move the facial muscles. I came home on an undignified run, experiencing a lively sense of the inadequacy of two hands to protect two ears and a nose. Did the Creator intend man to inhabit high latitudes?

At nightfall, father, Bill, and Jim, the two latter being my younger brothers, arrived

from their offices, each in succession declaring, with many "whews" and "yugs," that it was by all odds the coldest night yet. Undeniably we all felt proud of it too. A spirited man rather welcomes ten or fifteen degrees extra, if so be they make the temperature superlatively low; while he would very likely grumble at a much less positive chilliness, coupled with the disheartening feeling that he was enduring nothing extraordinary. The general exaltation of spirit and suspension of the conventionalities for the time being, which an extraordinary hot or cold snap produces in a community, especially in the country, is noteworthy. During that run of mine to the post-office every man I met grinned confidentially, as if to say, "We're hearty fellows to stand it as we do." We regarded each other with an increase of mutual respect. That sense of fellowship which springs up between those associated in an emergency seemed to dispense with ordinary formalities, and neighbours with whom I had not a bowing acquaintance fairly beamed on me as we passed.

After tea, Ella (Ella was a sister) got the evening paper out of somebody's overcoat, and was running it over in the dainty, skimming fashion peculiar to the gentler sex when favouring the press with their attention. It reminds one of sea-birds skimming the water, and anon diving for a tidbit. She read aloud: "Old Prob. reports another cold wave on the way East. It will probably reach the New England States this evening. The thermometers along its course range from 40° below zero at Fort Laramie, to 38° in Omaha, 31° in Chicago, and 30° in Cleveland. Numerous cases of death by freezing are reported. Our readers will do well to put an extra shovelful on the furnace overnight."

"Don't forget that, Jim," said father.

A gentleman friend called to take Ella out to a concert or something of the sort. Her mother was for having her give it up on account of the cold. But it so happens that young people, who, having life before them, can much better afford than their

elders, to forego particular pleasures, are much less resigned to doing so. The matter was compromised by piling so many wraps upon her that she protested it was like being put to bed. But, before they had been gone fifteen minutes they were back again, half-frozen. It had proved so shockingly cold they had not dared to keep on, and persuaded themselves accordingly that the entertainment had probably been postponed. The streets were entirely deserted; not even a policeman was visible, and the chilled gas in the street lamps gave but a dull light.

Ella proposed to give us our regular evening treat of music, but found the corner of the room where the melodeon stood too cold. Generally the room is warm in every part, and Jim got upbraided for keeping a poor fire. But he succeeded in proving that it was better than common; the weather was the matter. As the evening wore on, the members of the family gradually edged around the register, finally radiating from it as a centre like the spokes of a wheel, of which the collected feet of the group made the hub.

My wife is from the Southern States, and the huge cold of the North had been a new and rather terrifying experience to her. She had been growing nervous all the evening as the signs and portents of the weather accumulated. She was really half-frightened.

"Aren't you afraid it will get so cold it will never be able to get warm again, and then what would become of us?" she asked.

Of course we laughed at her, but I think her fears infected me with a slight vague anxiety as the evidences of extraordinary and still increasing cold went on multiplying. I had so far gotten over my bravado earlier in the evening that I should have been secretly relieved if the thermometer had taken a turn.

At length, one by one, the members of the family, with an anticipatory shiver over the register, went to their rooms and were doubtless in bed in the shortest possible

time, and I fear without saying their prayers. Finally, my wife suggested that we had better go before we got too cold to do so.

The bedroom was shockingly cold. Going to bed is a test of character. I pride myself on the fact that generally, even when my room is cold, I can, with steady nerve and resolute hand, remove the last habili-ment, and without undignified precipitation reach for and indue the nocturnal garment. I admit, however, that on this occasion I gave way to a weak irresolution at the critical instant and shivered for some moments in constantly increasing demoralization, before I could make up my mind to the final change. Then ensued the slow and gradual conquest of the frozen bed to a tolerable warmth, a result attained only by clever strategic combinations of bed-clothes and the most methodical policy. As I lay awake, I heard the sides of the house crack in the cold. "What," said I to myself with a shiver, "should I do if anything happened that required me to get up and dress again?" it seemed to me I should be capable of letting a man die in the next room for need of succour. Being of an imaginative temperament, not to feel prepared for possible contingencies is for me to feel guilty and miserable. The last thing I remember before dropping off to sleep was solemnly promising my wife never to trust ourselves North another winter. I then fell asleep and dreamed of the ineffable cold of the interstellar spaces, which the scientific people talk about.

The next thing I was sensible of was a feeling of the most utter discomfort I ever experienced. My whole body had become gradually chilled through. I could feel the flesh rising in goose pimples at every movement. What has happened? was my first thought. The bed-clothes were all there, four inches of them, and to find myself shivering under such a pile seemed a reversal of the laws of nature. Shivering is an unpleasant operation at best and at briefest; but, when one has shivered till the flesh is lame, and every quiver is a racking,

aching pain, that is something quite different from any ordinary shivering. My wife was awake and in the same condition. What did I ever bring her to this terrible country for? She had been lying as still as possible for an hour or so, waiting till she should die or something; and feeling that if she stirred she should freeze, as water near the freezing point crystallizes when agitated. She said that when I had disturbed the clothes by any movement, she had felt like hating me. We were both almost scared, it must be confessed. Such an experience had never been ours before. In voices muffled by the bed-clothes we held dismal confab, and concluded that we must make our way to the sitting-room and get over the register.

I have had my share of unpleasant duties to face in my life. I remember how I felt at Spottsylvania when I stepped up and out from behind a breastwork of fence rails over which the bullets were whistling like hailstones, to charge the enemy. Worse still, I remember how I felt at one or two public banquets when I rose from my seat to reply to a toast, and to meet the gaze of a hundred expectant faces, with an overpowering consciousness of looking like a fool, and of total inability to do or say anything which would not justify the presumption. But never did an act of my life call for so much of sheer will-power as stepping out of that comfortless bed into that freezing room. It is a general rule getting up in winter mornings that the air never proves so cold as was anticipated while lying warm in bed. But it did this time, probably because my system was deprived of all elasticity and power of reaction by being so thoroughly chilled. Hastily donning in the dark what was absolutely necessary, my poor wife and myself, with chattering teeth and prickly bodies, the most thoroughly demoralized couple in history, ran down-stairs to the sitting-room.

Much to our surprise, we found the gas lighted and the other members of the family already gathered there, huddling over the register. I felt a sinking at the heart as I

marked the stifled, anxious look on each face, a look that asked what strange thing had come upon us. They had been there, they said, for some time. Ella, Jim, and Bill, who slept alone, had been the first to leave their beds. Then father and mother, and finally my wife and I, had followed. Soon after our arrival there was a fumbling at the door, and the two Irish girls, who help mother keep house, put in their blue, pinched faces. They scarcely waited an invitation to come up to the register.

The room was but dimly lighted, for the gas, affected by the fearful chill, was flowing slowly and threatened to go out. The gloom added to the depressing effect of our strange situation. Little was said. The actual occurrence of strange and unheard-of events excites very much less wonderment than the account of them written or rehearsed. Indeed, the feeling of surprise often seems wholly left out of the mental experience of those who undergo or behold the most prodigious catastrophes. The sensibility to the marvellous is the one of our faculties which is, perhaps, the soonest exhausted by a strain. Human nature takes naturally to miracles, after all. "What can it mean?" was the inquiry a dozen times on the lips of each one of us, but beyond that, I recall little that was said. Bill, who was the joker of the family, had essayed a jest or two at first on our strange predicament, but they had been poorly received. The discomfort was too serious, and the extraordinary nature of the visitation filled every mind with nameless forebodings and a great unformed fear.

We asked each other if our neighbours were all in the same plight with ourselves. They must be, of course, and many of them far less prepared to meet it. There might be whole families in the last extremity of cold right about us. I went to the window, and with my knife scraped away the rime of frost, an eighth of an inch thick, which obscured it, till I could see out. A whitish-gray light was on the landscape. Every object seemed still, with a quiet peculiar stillness that might be called intense. From

the chimneys of some of the houses around, thick columns of smoke and sparks were pouring, showing that the fires were being crowded below. Other chimneys showed no smoke at all. Here and there a dull light shone from a window. There was no other sign of life anywhere. The streets were absolutely empty. No one suggested trying to communicate with other houses. This was a plight in which human intercourse could avail nothing.

After piling all the coal on the furnace it would hold, the volume of heat rising from the register was such as to singe the clothes of those over it, while those waiting their turn were shivering a few feet off. The men of course yielded the nearest places to the women, and, as we walked briskly up and down in the room, the frost gathered on our moustaches. The morning, we said, would bring relief, but none of us fully believed it, for the strange experience we were enduring appeared to imply a suspension of the ordinary course of nature.

A number of cats and dogs, driven from their accustomed haunts by the intense cold, had gathered under the windows, and there piteously moaned and whined for entrance.

Swiftly it grew colder. The iron casing of the register was cold in spite of the volume of heat pouring through it. Every point or surface of metal in the room was covered with a thick coating of frost. The frost even settled upon a few filaments of cobweb in the corners of the room which had escaped the housemaid's broom, and which now shone like hidden sins in the day of judgment. The door-knob, mopboards, and wooden casings of the room glistened. We were so chilled that woollen was as cold to the touch as wood or iron. There being no more any heat in our bodies, the non-conducting quality of a substance was no appreciable advantage. To avoid the greater cold near the floor, several of our number got upon the tables, presenting, with their feet tucked under them, an aspect that would have been sufficiently laughable under other circumstances. But, as a rule,

fun does not survive the freezing point. Every few moments the beams of the house snapped like the timbers of a straining ship, and at intervals the frozen ground cracked with a noise like cannon,—the hyperborean earthquake.

• A ruddy light shone against the windows. Bill went and rubbed away the ice. A neighbour's house was burning. It was one of those whose chimneys were vomiting forth sparks when I had looked out before. There was promise of an extensive conflagration. Nobody appeared in the streets, and, as there were intervening houses, we could not see what became of the inmates. The very slight interest which this threatening conflagration aroused in our minds was doubtless a mark of the already stupefying effect of the cold. Even our voices had become weak and altered.

The cold is a sad enemy to beauty. My poor wife and Ella, with their pinched faces, strained, aching expression, red, rheumy eyes and noses, and blue or pallid cheeks, were sad parodies on their comely selves. Other forces of nature have in them something the spirit of man can sympathize with, as the wind, the waves, the sun; but there is something terribly inhuman about the cold. I can imagine it as a congenial principle brooding over the face of chaos in the æons before light was.

Hours had passed, it might have been years, when father said, "Let us pray." He knelt down, and we all mechanically followed his example, as from childhood up we had done at morning and evening. Ever before, the act had seemed merely a fit and graceful ceremony, from which no one had expected anything in particular to follow, or had experienced ought save the placid reaction that commonly results from a devotional act. But now the meaning so long latent became eloquent. The morning and evening ceremony became the sole resource in an imminent and fearful emergency. There was a familiar strangeness about the act under these circumstances, which touched us all. With me, as with most, something of the feeling implied in the

adage, "Familiarity breeds contempt," had impaired my faith in the practical efficacy of prayer. How could extraordinary results be expected from so common an instrumentality, and especially from so ordinary and every-day a thing as family prayer? Our faith in the present instance was also not a little lessened by the peculiar nature of the visitation. In any ordinary emergency God might help us, but we had a sort of dim apprehension that even He could not do anything in such weather. So far as humbleness was concerned, there was no lack of that. There are some inflictions which, although terrible, are capable of stirring in haughty human hearts a rebellious indignation. But to cold succumb soul and mind. It has always seemed to me that cold would have broken down Milton's Satan. I felt as if I could grovel to be vouchsafed a moment's immunity from the gripe of the savage frost.

Owing to the sustaining power there is in habit, the participation in family devotions proved strengthening to us all. In emergencies, we get back from our habits the mental and moral vigour that first went to their formation, and has since remained on interest.

It is not the weakest who succumb first to cold, as was strikingly proved in our experience. The prostration of the faculties may be long postponed by the power of the will. All assaults on human nature, whether of cold, exhaustion, terror, or any other kind, respect the dignity of the mind, and await its capitulation before finally storming the stronghold of life. I am as strong in physique as men average, but I gave out before my mother. The voices of mother and Bill, as they took counsel for our salvation, fell on my ears like an idle sound. This was the crisis of the night.

The next thing I knew, Bill was urging us to eat some beefsteak and bread. The former, I afterward learned, he had got out of the pantry and cooked over the furnace fire. It was about five o'clock, and we had eaten nothing for nearly twelve hours. The general exhaustion of our powers had prevented

a natural appetite from making itself felt, but mother had suggested that we should try food, and it saved us. It was still fearfully cold, but the danger was gone as soon as we felt the reviving effect of the food. An ounce of food is worth a pound of blankets, Trying to warm the body from the outside is working at a tremendous disadvantage. It was a strange picnic, as, perched on chairs and tables in the dimly lighted room, we munched our morsels, or warmed the frozen bread over the register. After this, some of us got a little restless but forgetful sleep.

I shall never forget my sensations when, at last, I looked out at the eastern window and saw the rising sun. The effect was indeed peculiarly splendid, for the air was full of particles of ice, and the sun had the effect of shining through a mist of diamond dust. Bill had dosed us with whisky, and perhaps it had got into our heads, for I shouted, and my wife cried. It was at the end of the weary night, like the first sight of our country's flag when coming home from a foreign world. In the course of the morning we regained our usual animation.



CROCODILE TALES.

WHILST encamped amongst the Baris of the Nile region, Sir Samuel Baker thus records his troubles with the crocodiles :—

“Our enemies were not confined to the land only : the crocodiles in the neighbourhood of Gondokoro were exceedingly ferocious. As the natives were so much in the habit of swimming to and fro

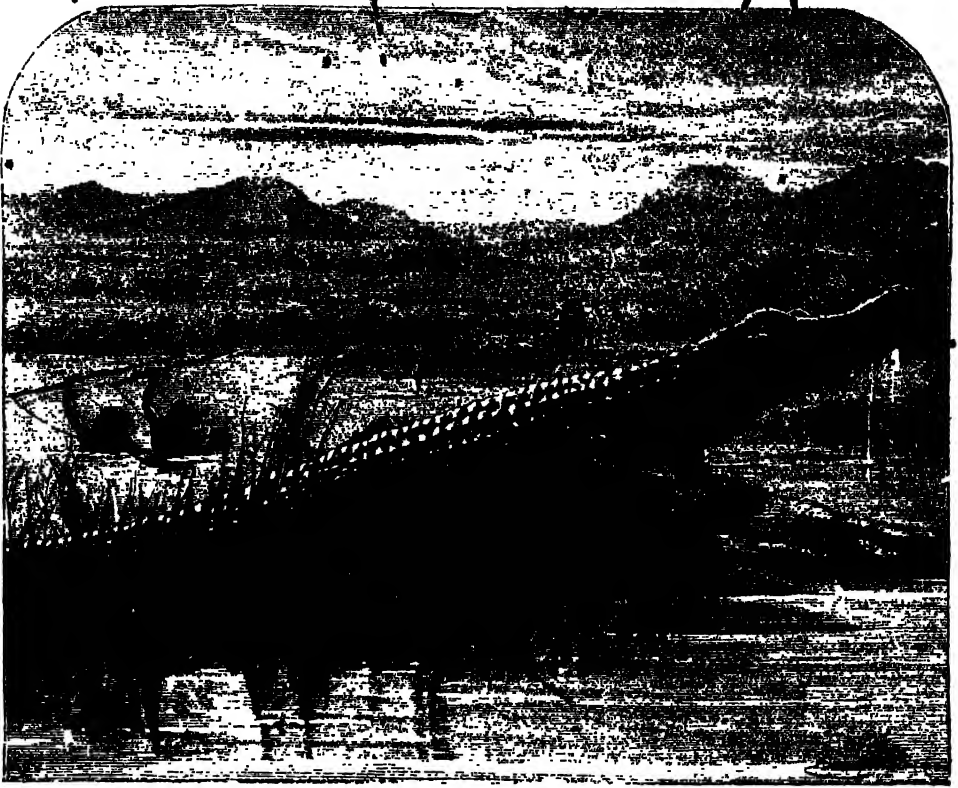
with their cattle, these wily creatures had been always accustomed to claim a toll in the shape of a cow, calf, or nigger. Two of Abou Saood's sailors were carried off on two consecutive days. One of my soldiers, while engaged with many others in the water, only hip deep, was seized by a crocodile. The man, being held by the leg below the knee, made a good fight, and thrust his finger into the creature's eyes ; his comrades at the same time assisted and rescued him from absolute destruction ; but the leg-bone was so smashed and splintered in many places, that he was obliged to submit to amputation.

One of my sailors had a narrow escape. He and many others were engaged in collecting the leaves of a species of water convolvulus that makes an excellent

spinach ; this plant is rooted on the muddy bank, but it runs upon the surface of the water, upon which its pink blossoms are very ornamental.

The sailor was stooping from the bank to gather the floating leaves, when he was suddenly seized by the arm at the elbow joint. His friends immediately caught him round the waist, and their united efforts prevented him from being dragged into the water. The crocodile, having tasted blood, would not quit his hold, but tugged and wrenched his arm completely off at the elbow joint, and went off with his prize. The unfortunate man, in excruciating agony was brought to the camp, where it was necessary to amputate another piece slightly above the lacerated joint.

I made a point of carrying a rifle at all times, simply to destroy these terrible reptiles. There never was a better rifle than the ‘Dutchman,’ made by Holland, of Bond Street. This little weapon was a double-barrelled breech-loader, and carried the Boxer bullet of Government calibre, with a charge of three drachms of powder. The accuracy of both barrels was extraordinary ; it was only sighted up to 250 yards, but by taking the bead very full it carried with great precision up to 300. I could generally make certain of crocodiles



if basking on a sand-bank within a hundred yards, as I could put the bullet exactly in the right place, either behind the eye or right through the centre of his shoulder. This handy rifle weighed 9½ lbs., and throughout the expedition it was almost as much one of my component parts as a bone of my body. I had a large supply of ammunition; thus I never lost an opportunity of shooting at a crocodile's head if I saw one above the surface. On many occasions they never moved from the spot when basking on sand-banks, but were simply extinguished.

One of our women went to the river to wash, but never returned. This was close to our diahbeeah; and the water being shallow, there is no doubt that she was seized by a crocodile.

I was one day returning from headquarters to my station, a distance of a mile and a half along the river's bank, when I noticed the large head of a crocodile about

thirty yards from the shore. I knew every inch of the river, and I was satisfied that the water was shallow. A solitary piece of waving rush that grew upon the bank, exactly opposite the crocodile, would mark the position; thus, stooping down, I quietly retreated inland from the bank, and then running forward, I crept gently towards the rush. Stooping as low as possible, I advanced till very near the bank (upon which grew tufts of grass), until, by slowly raising my head, I could observe the head of the crocodile in the same position, not more than twenty-six or twenty-eight yards from me. At that distance the 'Dutchman' could hit a half-crown; I therefore made sure of bagging. The bank was about four feet above the water; thus the angle was favourable, and I aimed just behind the eye. Almost as I touched the trigger, the crocodile gave a convulsive start, and turning slowly on its back, it stretched its

four legs above the surface, straining every muscle; it then remained motionless in this position in water about two feet deep.

My horse was always furnished with a long halter or tethering rope; so I ordered the syce and another man to jump into the river and secure the crocodile by the rope fastened round the body behind the fore legs. This was quickly accomplished, and the men remained knee-deep, hauling upon the rope to prevent the stream from carrying away the body. In the meantime Monsoor had mounted my horse, and galloped off for assistance to the camp of the 'Forty Thieves.'

Crocodiles are very tenacious of life, and although they may be shot through the brain and be actually dead for all practical purposes, they will remain motionless at first, but they will begin instinctively to move the limbs and tail a few minutes after receiving the shot. If lying upon a sand bank, or in deep water, they would generally disappear, unless secured by a rope, as the spasmodic movements of the limbs and tail would act upon the water, and the body would be carried away.

The crocodile, that had appeared stone dead, now began to move its tail, and my two men, who were holding on to the rope, cried out that it was still alive. It was in vain that I assured the frightened fellows that it was dead. I was on the bank, and they were in the water within a few feet of the crocodile, which made some difference in our ideas of its vivacity. Presently the creature really began to struggle, and the united efforts of the men could hardly restrain it from getting into deeper water. The monster now began to yawn, which so terrified the men that they would have dropped the rope and fled had they not

been afraid of the consequence, as I was addressing them rather forcibly from the bank. I put another shot through the shoulder of the struggling monster, which appeared to act as a narcotic until the arrival of the soldiers with ropes. No sooner was the crocodile well secured than it began to struggle violently; but a great number of men hauled upon the rope, and when it was safely landed I gave it a blow with a sharp axe on the back of the neck, which killed it by dividing the spine.

It was now dragged along the turf until we reached the camp, where it was carefully measured with a tape, and showed an exact length of twelve feet three inches from snout to end of tail.

The stomach contained about five pounds' weight of pebbles, as though it had fed upon flesh resting upon a gravel bank, and had swallowed the pebbles that had adhered. Mixed with the pebbles was a greenish, slimy matter, that appeared woolly. In the midst of this were three undeniable witnesses that convicted the crocodile of wilful murder. A necklace and two armlets, such as are worn by the negro girls, were taken from the stomach! The girl had been digested. This was an old malefactor whose death was a good riddance to the whole of the neighbourhood.

I have frequently seen crocodiles upwards of eighteen feet in length, and there can be little doubt that they sometimes exceed twenty; but a very small creature of this species may carry away a man while swimming. The crocodile does not attempt to swallow an animal at once, but having carried it to a favourite feeding place, generally in some deep hole, it tears it limb from limb with teeth and claws, and devours it at leisure."

ADVENTURE WITH WOLVES.



DURING one of my journeys through Russia (says a writer in the "Leisure Hour") I met with an adventure which still, after a lapse of five years, sends a thrill of horror through me when I think of it. I have seldom spoken of the scene, and never written any account of it. Doing so now may be a pleasant relief to memory, or at least the reader may be pleased at the expense of my recollections.

I was travelling with a brother. Who and what we both are is of no consequence. Suffice it to say that we are inhabitants of Cronstadt, and having liberty to dispose of the winter season as we liked, I proposed to my brother to surprise our sister, then living in Wolsk, a small town some eighty or ninety miles northwards from Saratow, by paying her a Christmas visit. He readily agreed, and having made the necessary preparations, we started on our journey.

I shall pass the tedious travelling by rail to Moscow and thence to Koslov, as it is not my intention to describe the whole journey, which, though some interesting incidents happened to us, is still, more or less, the same that every traveller meets with on the stations, etc. I may only mention that while passing through Taula, a town renowned in Russia for its manufacture of hardware and arms, I bought a handsome fowling-piece to present to my brother-in-law, who, although not a professed sportsman, yet likes to go for a ramble through the wood now and then. I had the gun loaded in the same town, one barrel with a bullet and the other with coarse shot, in order that I might have a fair trial of it on the road.

As we were in no particular hurry, we rested ourselves in some of the towns that

we passed, until we arrived in Koslov, from which place we had to travel by post sledges, and where we bought a basketful of provisions, such as are necessary for this way of travelling. We had a pleasant journey until we arrived at Kirsauoff. We were warmly dressed, both of us well armed, with a *rortik*, a kind of dagger used by the marine officers, and each had one of Colt's revolvers. The roads were, except in some places, what is generally termed very good, and the weather was between 10° and 15° R. below zero. Owing to our liberal treatment of the station-keepers and the *gemstshik* (driver), we were never detained for horses, which is very often the case. Having passed the night in Kirsauoff, we started early on our journey, and after exchanging horses at the first station, we again went forward, little expecting what was in store for us.

We entered a forest, which extended for about ten miles. The weather was particularly favourable, and bringing our basket to light, we regaled ourselves with a hearty breakfast, at the same time not forgetting to take a good draught from our travelling-flask, with a portion of which we treated the driver, who in return related to us some anecdotes of his life, some of which were very amusing and cheered us not a little. All at once our horses started and showed evident signs of fright. We looked round for the cause of it, when we saw, not above forty yards from us, what we took for a dog, rolling and barking on the snow. We made some remarks to the driver, astonished that the horses should get frightened at a dog, when he told us that this was a wolf. The chance of trying the new gun was too tempting not to give way. Accordingly I told the driver to stop the horses, which was almost an impossible task for him, they being so frightened. However, I watched the opportunity, took a short

aim, and fired. The wolf gave a jump and a howl and then turned into the wood.

I could see that I had wounded him, but no time was allowed to us to pursue him, for scarcely had I fired, when some twenty or thirty wolves rushed out of the forest in pursuit of us with fearful howling, which I shall never forget. There was no need telling the driver to hurry the horses on, for they were flying already of their own accord. But the wolves were as fast behind us, gaining upon us at every minute. It was a fearful moment. The sweat was pouring down our faces, but we had no time to heed it. Afraid of being thrown out of the sledge, from the quickness of our flight, which would have been sudden death, we held on for our life. With our daggers, which were only sharpened at the point, though, fortunately, heavy enough to strike with, we kept the nearest wolves from jumping into the sledge, while we only shot at those nearest to the horses' heads, as we did not dare waste a single shot, not having time to reload our weapons. The horses understood well that their lives depended on the swiftness of their legs, and were literally covered with foam.

Two of the wolves we wounded severely, and when they fell they were instantly torn to pieces and devoured by their own hungry comrades. Others, that we only slightly wounded, still kept in pursuit of us, howling fearfully all the time. With thankful hearts we saw the forest was getting to an end, and we were within a mile from the station, a hut standing a little apart from the adjoining village. Unfortunately, on clearing the forest the roads were worse, and it was a wonder to us how we still kept in the sledge without being thrown out. But the noble horses did not slacken their speed. On nearing the village, the greater part of the wolves held back, but still five or six of them, more ferocious than the rest, were in hot pursuit, which they kept on so perseveringly that they were not three paces

behind us when we came to the gates of the station, against which the horses ran with such a force as to throw them open with the shafts of the sledge. The people in the station, attracted by our shots, and seeing our position through the windows, rushed out, armed with heavy sticks and axes, and successfully drove the wolves back again, who were actually so daring as to pursue us into the very yard of the station.

Even when safe in the enclosure we could hardly believe in our deliverance, and were at least for five minutes staring wildly, around us looking defiantly for wolves, until the people could make us understand that we were really quite safe. Never were our thanksgivings more sincere than when we entered the hut. Our driver, who entered with us, crossing himself before the image of the Saviour, said: "Only to God we owe this deliverance," and truly we felt this as much as he did. We remained two days in the village to recover from our fright, and my brother being weaker than myself, I was afraid the frightful shock would make him seriously ill, which would have been another trial, as the nearest surgeon lived in Serdobsck, a town about twenty miles off. During our stay in this village, I learnt that just this time in the year, viz., from the middle of December to the middle of January, the wolves always went in herds, and that the one I wounded first must have been a she-wolf. They rarely venture to attack post conveyances, owing to the noise of the bells, which frightens them, unless driven to it by hunger, or tempted (as in our case) by the passengers. After two days we again started, but this time in company with a merchant, who went the same route as we did, and whose lively spirit made him an agreeable companion to us, and assisted us a great deal to recover from our late adventure. But only the joyful meeting with our sister could entirely pacify us from our encounter and satisfy us with our journey.



MY CAPTIVITY IN ABYSSINIA.

THE strange and unparalleled captivity of a few missionaries and British officials on the rocky heights of Magdala, and their unscathed deliverance, excited much sympathy and interest. One of the missionaries, Mr. Stern, gives a thrilling account in his book, "The Captive Missionary," of the prolonged imprisonment, the savagery of the inhuman Theodore, and the hopes and fears excited by the approach of the expeditionary force under Lord Napier. He says: "Circumstances which were beyond human control unfortunately made me the longest and the most tried of the sufferers. Providence ordered it

so." I had neither committed a political nor a criminal offence worthy of the stick, fetters, the torturing rope, or fifty-two months rigorous captivity. It is true king Theodore asserted that I had defied him, an assertion that was in perfect harmony with his conduct towards every one, whether ambassador, consul, or missionary, who could not minister to his wild ambition or swell the number of his white artisans."

In great bodily suffering and tortured by conflicting emotions at witnessing the tyrannous butchery of his unoffending subjects, the months and years dragged wearily on. At times thoughts of suicide or despairing schemes for escape, alternately occupied their minds. But the year of release was, when they little expected it, at hand.

"On Friday, November 13, 1867, we had a happy day. Messengers from the coast arrived about noon; but it was not before evening that the letters were smuggled into our prison. There were, as usual, none for me. A kind of fatality hung over my letters. My friends wrote, but of the scores which they forwarded not a tithe ever reached me. Vexed and annoyed, I snatched up a fragment of Guizot's '*Histoire de la Civilisation*,' which Mr. Rosenthal had secured during his stay at Gaffat, and began to study the influence of monasticism on the moral and social condition of Europe. A summons to come immediately to Dr. Blanc's hut was significant of good news. The clapping and cheering of several of my companions confirmed my anticipation. 'Cheer up, Stern!' exclaimed the doctor. 'Good news! Troops are coming! Colonel Merewether has landed! Hurrah for old England!' The budget was worthy of the plaudits it elicited from the captives. Oh, it was a happy evening, that 13th of November! Gloom and despondency had entirely vanished. No vacant glance, no dejected countenance, no shaded brow was visible among the eight victims of Theodore's tyranny. Our chains were light, our hearts merry; we were in a transport of delirious joy—a sensation to which the majority, for more than four years, had been perfect strangers.

British troops and King Theodore were now both on the road to Magdala. But who will arrive first? Will our expected liberators forestall our dreaded captor, or will they allow him to inundate the Amba with blood ere they make their appearance? Such and similar reflections forced themselves very soon on our minds, and filled us with intense anxiety and suspense. Never were the chances of freedom and death so equally balanced; never were the steps of friend and foe so eagerly watched. We were approaching the goal of our suffering, the crisis of our fate. A tranquil confidence that the days of banishment and exile were drawing to a close, however, dissipated those gloomy forebodings,

which horrible tortures, ten times worse than death, conjured before the mind. We felt, at least most of us felt, that God had been and would be with us, and this conviction shed a peaceful serenity over our dismal prison home.

Early the following April, a messenger brought a letter from Sir Robert, now Lord Napier of Magdala. The road to the very camp being infested by robbers and insurgents, it was necessary to stitch the missive in a seam of the bearer's ragged inexpressibles to ensure its safety. Theodore was quite indignant at receiving a small note, instead of a large letter. He was told that it was not disrespect, but necessity, that had compelled the commander-in-chief to send such an epistle. 'It is true,' he responded, 'the road is full of thieves and robbers, but who is this man that addresses himself to me? I wrote some years ago to his Queen, and she did not answer me; does he suppose that I shall enter into a correspondence with him? Take the paper away, I don't want to see it.' This was, however, merely bluster; for when the messenger and his own chiefs had retired, he sent for Samuel, and requested to know the contents of Lord Napier's despatch.

In the afternoon of the same day he was angry, passionate, and savage. To quell the fury of his wrath, it was necessary that blood should flow. He had not yet decided on the massacre of his prisoners, but to appease the demon that devoured his heart, a few victims had to be sacrificed. Seven individuals were immediately selected for a holocaust to pacify the blood-thirsty Moloch. Among the innocent sufferers was a young woman and her infant, the wife of the fugitive Becherward Confou, who had decamped in September last. Ever since the flight of her husband, she had been a prisoner, and probably the long reprieve she had experienced led her to cherish the pleasing illusion that her young life, and that of her babe, would not be sacrificed to the despot's resentment. Poor woman—like hundreds more—she dreamt of life, freedom, and happiness, till the

executioner dragged her and the innocent creature clasped in her slender arms, to a horrible and cruel death.

These incipient butcheries were merely a prelude to still greater atrocities and more extensive massacres. In the afternoon of the next day we were suddenly startled by the sound of an intermittent musketry. I looked out of the tent to see whether the king was *fackering* (bragging). The rush of armed soldiers from every part of the camp, indicated that something serious and disastrous was taking place. All was hushed, as if the silence of all sounds had suddenly traversed those lines of huts and tents in which noise and clamour perpetually reigned. The rattle of musketry blended with the yells of despair, and the shouts of rage fell, however, with an ominous and appalling horror on our ears. 'What is the matter?' I inquired of my neighbour. 'Hist,' was the response, 'the king is killing all the prisoners.' These terrible words diffused an aguish chill through my very heart. 'What!' I involuntarily ejaculated, 'killing his prisoners—men whose only crime consists in their having served, and served faithfully, too, a tyrant to whom they ought never to have tendered allegiance?' Most of the sufferers were our former companions in the common gaol, which deepened the sympathy we felt for them in their last mortal struggle. The sun had already disappeared from the horizon, and twilight spread a dismal, dusky hue over the scene around, and still the firing continued unabated. With night it gradually diminished, and then only isolated shots reverberated across the panic-stricken camp.

The slaughter lasted about three hours, and during that interval three hundred and seven human beings were, unwarned, and perhaps unprepared, hurled into eternity. Some of the prisoners did not unresistingly yield to their woeful doom. One, Immer Ali, a native of Ferga, near the Tzana Lake, formerly a chief of consideration in his province, in spite of hand and foot chains, with a convulsive grasp dragged his execu-

tioner towards the precipice over which he was to be hurled. The hangman, who dreaded the doom which he intended to inflict on his fellow man, shouted for help. On hearing the cry the tyrant, tiger-like, sprang forward and with his gory sword literally hacked the man to pieces. One victim after another lay writhing and quivering in the last pangs at the foot of the dizzy precipice, and still the tyrant's rage was unappeased. 'Bring the white men, and let their blood flow, mingled with that of my own subjects,' was the order that fell from his lips. Already, we were informed, whole bands of ruffians stood prepared to seize the intended prey, when several chiefs, no friends of the foreign captives, stepped forward, and requested that our execution might be deferred till next day. 'Your Majesty,' they respectfully remarked, 'the white men do not deserve the easy death of the sword and bullet; no, keep them till to-morrow, and then let the slow torture of a flaming hut put an end to their existence.' 'You are right,' was the response.

In the afternoon of the same day we heard that a division of the expeditionary force had approached till within two hours of our fortress. Some of our servants who had followed us came every instant into our huts with some intelligence about the dress, looks, and attitude of the soldiers whom their piercing glances detected on the heights around Arogié. Samuel, who was justly afraid lest their observations should be reported, and draw on us the tyrant's resentment, ordered none to move out of their tents, if they dreaded the whip.

Between three and four p.m., the boom of a distant thunder, which the rocks and cliffs reverberated for miles and miles around the isolated Amba, made us all start on our legs. 'Was that rattle a peal of thunder or the roar of cannon?' formed the question of every lip. Again and again the sky above awakened the sleeping echoes of the surrounding scenes, intermingled apparently with other sounds than those created by the shadowy and hazy clouds that hung pall-like over our homes. It was now no

longer doubtful that the royal artillery was in full play, and that the king was either bragging or engaged in a regular fight. We could not believe that he had ventured to measure his strength with disciplined troops, and the victorious li-li-lil, which floated from the royal camp up to the fortress, where every woman and child repeated the shrill notes, till their throats were hoarse from the exertion, rendered the very thought ridiculous and absurd. At ten o'clock in the evening, Messrs. Flad, Waldemeier, and

several of the king's servants, came to our prison to announce to us the cheering intelligence that a fight had taken place, and that his Majesty's troops had sustained a most signal and fatal defeat. The crest-fallen tyrant who, only little more than eighteen months before, claimed the universe for his realm, had learnt a lesson from the destructive contest at Arobie which, had it been administered to him a few years before, might have spared Abyssinia an incalculable amount of bloodshed,



misery, and desolation. 'Once I thought,' was the message to Mr. Rassam, 'that your people were women, and could not stand before me, but I find that they are men. I have been beaten by the *fit aurari* (advanced guard). My musketeers are dead. Prove that you are my friend, and reconcile me with the man who is stronger than I.' Mr. Rassam returned a polite and most judicious reply. He informed the king that the object of his mission had been the re-

establishment of peace between England and Abyssinia, and that although he had failed in achieving this end, he was still as friendly disposed as ever, and if his Majesty was inclined to listen to his counsel, he would advise him to give up to the commander-in-chief all the prisoners. Not to irritate the chafed lion he, however, proposed to send Lieut. Prideaux as his envoy to Lord Napier, if his Majesty consented to send one of the Europeans

and some of his own chiefs to accompany him.

Excited by drink, his Majesty, when the delegates returned, had become oblivious of the errand on which they had been despatched. Towards dawn the fumes of the alcohol evaporated, and the messengers received instructions to depart for the British camp.

Lord Napier was exceedingly attentive and courteous towards the native envoy, Dejatch Alamic. His affability did not, however, modify his demands for the surrender of all the Europeans, and the unconditional submission of Theodore to the Queen of England, who would award him honourable treatment.

The messengers had been gone about two hours, when the king, goaded to despair by the mad fury that burned in his heart, seized a pistol, and dashing the muzzle into his mouth, wanted to put an end to his own existence. Several of his chiefs promptly wrenched the weapon out of his hand. In the struggle the pistol exploded, and inflicted a wound on the royal ear. The chiefs, who were all deeply affected, urged him to shake off all despondency, and to prove himself worthy of the name he bore. 'Our lives are yours,' they said, 'and we will fight, and if necessary, die with you. Let us bravely defy the Fremdjoj, and if they venture to approach, they shall have dead and not living captives.' To this honest remonstrance—and it was honest, for they fell fighting at his side during the capture of Magdala—he deigned no reply, but turning to Betwodet Hassanei and Ras Bissawur, he ordered them to go to our prison, and inform us that we were free, and could go to the camp. I could scarcely believe the import of the message, so utterly opposed did it appear to reason, common sense, and the usual tactics of Theodore.

We instantly got ready to obey the royal behest, the most gracious he ever issued, when another messenger arrived to inform us that it was probably too late that day to reach the British camp, and that we should

postpone our departure till the next day. As we all harboured a vague dread that our exit was a mere blind to give *éclat* to some base treachery, we did not regret another night's reprieve. After waiting an hour, more peremptory orders were conveyed to us that we should start. As we emerged out of our prison we encountered many faces bathed in tears. It was touching to see that even at Magdala there were hearts not indifferent to the foreigners, or unconcerned about our freedom and release. The kind and sympathetic groups, like ourselves, imagined that the march into the royal camp was a short funeral procession to execution and the grave. Near the gates of the fortress we met Messrs. Meyer and Saalmüller, two of the European artisans, who were to escort us into the British camp. 'Is there any treachery?' we anxiously inquired of our appointed conductors. 'We are not aware that there is,' was the response. 'We know for certain,' they added, 'that a little while ago the king intended to commit suicide, and had he succeeded in his design, you and every European in the camp would, ere this, have fallen beneath the lances and swords of the enraged chiefs.' That the restraint imposed on the tyrant's violence should, humanly speaking, prove the safeguard of his captives, seemed to me an interposition so miraculous and Divine, that I dismissed all apprehensions, and rapturously contemplated the approaching hour of freedom and liberty.

The order now came that we should quit the camp without delay. We were quite willing to obey this behest, had not two of the chiefs, who were friendly disposed towards us, unsolicited sent a message to their master that we were loth to leave without a parting interview. Certainly we had no desire to encounter once more the ash-coloured countenance and vengeance-flashing eye of Theodore. The chiefs knew that perfectly well, and to forestall that sad catastrophe, which they anticipated, the commander-in-chief of the British forces would visit with a retributive vengeance,

they took every precaution to arrest it. Two or three messages flew forwards and backwards from the king to his white captives, and at last the order came that his Majesty would receive Mr. Rassam, and no one else.

Our friend, in full diplomatic uniform, and surrounded by a whole concourse of chiefs and royal domestics, hurried on to Fahlay whilst the other seven captives and Mrs. Rosenthal, who was a semi-prisoner, and always associated with us, which was not the case with the rest, were driven along a path that lay at the foot of serrated cliffs and shivered rocks that were literally crowded with spectators. King Theodore, we were told, was not two hundred yards from the spot where we stood. This startled us. Go on—stop—to the right, to the left, were the contradictory commands that hissed in whispering notes along the line formed by the captives and their guards.

Hemmed in by dizzy precipices and lofty rocks, the frowning countenance of the king in front, and the anxious and expectant gaze of numerous guards in the rear, we resolved not to risk the peril of an unguarded step till we positively knew what course to pursue. Pale and trembling we awaited the issue of the next few minutes. The clatter of shields and the glimmer of spears made me turn to the right, and to my amazement I beheld Theodore threading his way between huge blocks towards the path where we were standing. Instantly we all fell prostrate on the ground and saluted him. He looked flushed, distracted, and wild. When close to me, and I was the fifth in the rear, his fiery gaze lighted for a moment on me, and then in a smooth soft tone, he said: 'How are you? Good-bye.' It was the sweetest Amharic to which I had ever listened—the most rapacious sentence that ever greeted my ears. It was said that at the very moment when he dismissed Mr. Rassam, his hand grasped a gun, evidently with the design of discharging it at his white captives. Had he done so, the group of musketeers by whom he was surrounded would have followed his

example. Impelled by an invisible power, the weapon with the rapidity of the lightning's flash, dropped out of his hold, and Divine mercy, not Theodore's clemency, saved us from a violent death.

Slowly and solemnly we marched on our way. There was no haste or hurry which might have aroused the tyrant's wrath, and brought the executioner upon us, but the measured tramp of men who reluctantly leave a spot where they would willingly linger. Once, however, beyond the hated camp, we accelerated our steps and did not halt till we were within sight of our liberators' closely ranged conical tents. Evening had already set in, and dark shades shrouded every object from our view. On, on we rapidly strode. Suddenly we heard a challenge. They were Indian pickets. They saluted us in tones of evident pleasure. We advanced. The hum of voices became more distinct. There was a shout, a cheer, and a hurrah. A clear melodious voice resounded far above the hum and murmur of the wide-stretching lines, it was from its accents the voice of an officer, and the message it conveyed was affecting, solemn, and significant. 'God has heard His people's prayer, and disposed King Theodore to let his prisoners go.'

It was, indeed, a wonderful deliverance. King Theodore and his few faithful chiefs had no intention to grant us freedom and liberty. They had resolved to immolate us on that very path, which they foresaw our liberators would, ere many hours had elapsed, traverse. One word, and one only would have stretched us lifeless on the hard and rocky ground. 'God, however, was with us, and He alone conducted us safely through the midst of the murderous band, who were quite prepared to imbrue their hands in the white man's blood. Twice his chiefs, and particularly Ras Engeda, urged him, as we were quitting the camp, that he should wrench off our hands and feet, and thus demonstrate that he feared no enemy and dreaded no danger. 'No; I have already killed people enough, let the white men go and be free.'

HAVING yielded to an irresistible power, and given up his most valued hostages, he unhesitatingly complied with Lord Napier's firm and unbending demand, and on the following day, Easter Sunday, surrendered his European workmen and their families. This last act of submission may, perhaps, have been prompted by a faint hope that the commander-in-chief would now withdraw his troops and leave Magdala in possession of a gang of desperadoes, to carry on their atrocious and murderous trade. He forgot the condition imposed on him, and had to learn that a British general is as true to his word as he is faithful to his sword.

I was during the whole of that day in a state of delicious ecstasy and dreamy raptures. Unrestrained freedom appeared to me unnatural. I felt as if I could not divest myself of the idea that I was no longer guarded, that I needed not to conceal every scrap of paper, or burn the letters with which dear friends and kindred in anticipation greeted my safe arrival in the British camp. It was, indeed, a resurrection festival—a foretaste of that glorious resurrection, when the grave will be deprived of its precious treasures, death of its ghastly trophies, and the lap of decay and mortality become the abode of life and everlasting beauty.

In the afternoon, at the request of the senior chaplain, the Rev. E. S. Goodhart, I preached twice in the camp on the solemn subject suggested by the stupendous events of that grand festival of the Church. The roll of the drum, the clash of arms, the long line of troops, and above all, the vague consciousness that I was free, and stood among friends who had encountered innumerable hardships, toils, and privations, to rescue me and my companions out of the fangs of a remorseless tyrant, made my heart gush forth with emotions of the deepest gratitude towards God and man.

Early next morning all the troops marched up to Magdala. King Theodore, to forestall his capture, tried to decamp. His people feigned as if they intended to follow him. There was the usual bustle

and clamour of voices, the saddling of mules, and striking of tents; but after waiting for an hour—an hour in which was crowded and compressed a terrible future—he perceived that he was disobeyed, abandoned, and forsaken by the men in whom his last hopes and expectations were centred. In a trice his charger's head was turned towards the mutinous host. His effort to stimulate their courage and to animate their devotion was in vain. His voice had lost its charm, and his words fell on deaf ears. Indignant, furious, and almost mad, he clutched his pistol and stretched the nearest two dead on the spot where they stood. This outburst of rage did not frighten into submission the rebellious bands, and the dreaded leader of victorious legions, with his few devoted and faithful chiefs, was forced to seek a refuge and shelter from a foe he had so proudly defied, behind the ramparts of a rocky fortress. Desperation imparted vigour to his arm, and valour to his heart. His career of blood was, however, fated to close. He had enthralled myriads and myriads of helpless beings; he had rioted again and again in the throes and agonies of the weak and defenceless; he had literally shed streams of human blood, and now when every prospect looked dark and dismal, that very pistol which had been so familiar with death, became the instrument with which he sealed his own doom.

On the following morning, I rode with Mr. Goodhart and Captain Nicholson up to Magdala. Our path wound along the precipice, where lay in putrefying heaps the slaughtered corpses of the great king's prisoners. The sight made me shudder, and, almost loudly, I ejaculated: 'Here my mortal career would have terminated, had not an invisible power interposed in behalf of a helpless captive and the sharers of his misery.' On the Amba itself all was activity and animation. There was now no longer heard the clank of galling chains, or witnessed the sad glance of despair. Every one looked happy and content. There were still some prisoners with portions of

their fetters hanging on their legs. They had, however, no shadow on their brow; on the contrary, their hearts were overflowing with an excess of gratitude that stifled their voices, and only in broken accents they could breathe forth their true, genuine, and hearty blessings, on their deliverer (Lord Napier). It was quite an exciting scene. The whole fortress swarmed with crowds of the curious and busy. Some collected Theodore's treasures, others despatched them down to the camp, and not a few, like myself, idly sauntered about, to have a full view of a spot that will for generations to come live in the history of British enterprise, energy, and valour. The king had not yet been buried. He was laid out on a stretcher, in a hut which for many months formed the dungeon of one of his white captives.

To behold that man, whose nod or word had often caused myriads and myriads to tremble, now rigid, gory, and dumb, awoke in me many solemn reflections. I now no longer remembered the tyrant who had transformed fertile provinces into

tangled wildernesses, and happy homes into charred ruins. I no longer remembered the sufferings he had inflicted on me for four years and a half. I no longer remembered the throes and agonies of a nation, in which he found his delight to revel. No; my views wandered beyond the limits of time, and the visions that rose before my mind made me rush out of the familiar hut.

The expedition, undertaken in the cause of humanity, and followed by the prayers of thousands, had achieved a most noble, glorious, and bloodless triumph. Magdala, however, still stood out in bold relief from the surrounding scenery, a proud monument of Theodore's conquest and power. Unexpectedly, on the 17th April, a mass of dense smoke rose in circling columns from the centre of the fortress. In a few minutes it became more bright and luminous. The last stronghold of Theodore was on fire. It was a glorious sight—a sight which thrilled with joy the heart of the Amhara and Galla, the liberated captive and the victorious soldier.



FOREST TELEGRAPHS.



In the course of constructing telegraphs through unsettled countries a number of exciting adventures have been encountered, the particulars of which, garnered up in official records not very accessible to the public, are yet full of interest. The first narrative from which we shall quote is a report from the Argentine Republic, the writer being a young Scotchman, Mr. Charles Burton. The first telegraph in the dominion of the republic was opened in 1870, and consisted of one hundred and twenty-nine miles of line, but the system was rapidly extended thereafter; and Mr. Burton's report gives some graphic pictures of what had to be encountered in the course both of executing and maintaining the work.

One of the first troubles encountered was the yellow fever, which dispersed the greater part of the employes by death or sickness, the communication being maintained by great exertions on the part of the director and a few telegraphists who did not fail him during the moments of severe trial. The progress of the plague was reported daily by wire from the provinces, and Mr. Burton concludes this part of his story with the fervent hope that the wires may not have to perform the same duty again. At another time a dry season resulted in great fires in the forest, and the director found that besides the destruction of posts, the native people stole away the wire and otherwise destroyed his work. At another time great floods came, causing much loss to the contractors, as well as on the completed lines, by carrying away posts, wires and all for miles together. The rebellions, which appear to be more or less chronic in the states of South America, gave the telegraph director much trouble.

An order by a rebel chief is quoted, which displays no slight appreciation, on his part, of the advantages of telegraph communication. This chief ordered his men to cut the telegraph at a distance of three to six miles from each town, "taking care that the wire be cut at a distance of three yards from a post, so as to leave sufficient to wrap round each pole, and thus secure that the wires remain well stretched." The rebel had no doubt in view, that if the whirligig of time should bring him into power, he would wish to retain the benefit of telegraph communication. When Mr. Burton's men essayed to repair such interrupted lines, they were taken prisoners by the rebels, relieved of their tools, and told that if they attempted this again it would be at the risk of their lives.

The following extract from Mr. Burton's report—part of a plea he urges against the reduction of the pay of his linemen from forty to thirty "hard dollars" a month—gives a lively idea of such service through an unsettled and uncleared region: "These men have to go over their districts generally in stormy weather, as the rainy season is the most unpropitious for the telegraph. They must buy and maintain, at their own cost, the horses which are indispensable for their long journeys, carrying with them the necessary tools, following closely the telegraph over rivers, swamps, and in fact all kinds of country—as, if they were to leave the direct route of the telegraph to find a good road, an interruption in the wires might be passed unobserved."

From New Zealand, where an extended system of telegraphs is now in operation, we obtain some experiences even more remarkable than those from South America. Mr. Floyd, the electrician, furnishes a most interesting narrative of his work in the colony. He observes that, where a road has preceded the telegraph, the work there is not in any special way different from

such work at home. But in many cases the telegraph has been the pioneer of progress through almost unknown districts, inhabited by aboriginal natives, and it is in regard to such places that the interest of his narrative centres. "Under such circumstances, the work required from the telegraph engineer becomes of a most varied, and often of a most arduous character. He may have to cut a path through dense forest, to build temporary bridges, cut tracks contouring high hills, and make temporary roads across swamps, before any of his material can be placed on his line, and before supplies can be conveyed to where his men will be at work, and, worse than all, he may be met with Maori opposition that must be coaxed away." In lands where the Maoris have exclusive possession, the compulsory powers of the Colonial Telegraph Act could not be forcibly exercised, and bribery was useless, for concession in that way only led to extortionate demands. "The only weapons to be used were tact, patience, and determined persistence," and these, although trying to human nature, did not, Mr. Floyd says, often fail.

In constructing a line through two hundred and twenty miles of such a country, the first proceeding was that the constructor, with a surveyor and interpreter, started on horseback, with a pack-horse to carry tent, blankets, and food. After fifty miles had been gone over, the surveyor returned to organize a party of men to cut a line along the course selected, and to mark the site of each telegraph pole. Meanwhile the constructor with his interpreter proceeded on the journey, the whole distance occupying six weeks, and necessitating a good deal of "roughing" when night-fall found them far away from human habitation, and they had to camp out in the "forest primeval." As the expense of keeping open a special path through the forest for the linemen is great, made roads, or courses where roads would probably be made hereafter, were preferred, but a very large proportion of the line described was through

heavy timber, and in regions either sparsely peopled by Europeans or wholly in Maori occupation.

In the meantime, while the surveyor went on "pegging out" the route at the rate of about a mile a day, a series of contracts was prepared, dividing the work of clearing as much as possible amongst the residents, whether European or Maori, along the line. Thirty-two such contracts were made, running from £5 to £500 in amount, and it was found that the smaller settlers were very glad to undertake the clearing near their own locations. The work was to cut down all trees which could fall across the wire, and to make a clearing forty feet wide, removing all logs and scrub over the entire route, with a sixty-foot circle at each peg indicating the proposed position of a pole. As an additional precaution against the re-growth of underwood, a certain circle round each pole was dug up, and suitable grass seeds sown over the space. It is stated to be characteristic of a New Zealand forest, that when a clearing is made the trees on each side of the clearing wither and fall. And as the trees are of noble proportions—producing, as Mr. Floyd shows, splendid material for telegraph poles—the cutting down of large trees beyond the forty feet general clearing was often a work of great labour. From the luxuriance and density of the undergrowth, the first surveyors followed, as far as possible, existing Maori tracks, and even there they had to use tomahawk and bill-hook to clear their way. The cost of clearing the two hundred and twenty miles, the time occupied being six months, was £5,323. Some examples of exorbitant demands made by the Maoris are given. Where £300 was offered by the constructor, the Maori would demand £2,000; where a payment of £30 was offered, £200 would be demanded, and so on.

When the work of putting up the poles through native districts began, some curious results were seen. The erecting gang of Europeans was divided into parties of two men each, these obtaining labour locally to

assist in the work. Where Maori settlements were far apart the men selected for this labour would in the course of the work become very expert, but when the settlements were close together the labourers were changed every pole or two, the natives insisting that they to whom the land belonged should alone receive the money for working it. This element in the case gave the superintending instructor a good deal of hard work and anxiety, as he had to be everywhere at once, as it were, to meet objections, to pay wages, to alter a pole if the aboriginal owner of the ground objected to its place, and "generally to keep everybody in good temper." Although all this made the work of erecting the telegraph laborious and prolonged, it had in the end a good effect, for Mr. Floyd states that every Maori who had worked on the line looked on it thereafter as a monument to his own ingenuity, over which he was bound to keep a watchful eye. As a summary of the labour of thus extending to a half-civilised community one of the most notable of the inventions of civilised man, the following sketch of the life led by the constructor and his interpreter is full of interest. "During the twelve months from the commencement of the line till its completion, they continued travelling on horseback from end to end of the line. They were never more than three or four consecutive days in any one place, but rode about the country day after day without regard to weather all the year through. The constructor could not have clerical assistance; sometimes his saddle was his writing-desk, sometimes a fallen log served as both chair and table, and often he could not do better than lie face downward in a Maori hut, and use the floor for a writing-table. He carried writing materials, voucher forms, and a cheque-book constantly on the saddle, and had to be ready to give a contractor a progress payment, pay wages, or draw contracts, whenever and wherever the occasion required, without reference to the comfort or convenience of the circumstances surrounding him."

As a matter of practical telegraph construction, Mr. Floyd's description of the method adopted for carrying the wires across navigable rivers at high elevations is full of interest. As damage to such wires was most likely to happen in a gale, and as not one man in a hundred would venture to the top of a tall mast in a gale of wind, the plan was adopted of building wooden turrets, at first four-square and subsequently, for economy, triangular. The turrets were of open framework, with a ladder between each stage, so that in the heaviest gale the workmen could proceed to the top and repair wire damage. Such a turret, one hundred feet high, erected at Maketu, is stated to have cost £175—a heavy item in the construction, but perhaps fully justified from the circumstances stated.

The telegraphs of Asia Minor, British India, Russian Asia, Japan, etc., would each offer a chapter of difficulty and adventure not in any degree inferior to those detailed in the preceding sentences, while to the telegraphist as well as to the physicist, they present many features of special interest.

One of the earliest local telegraph lines in Eastern countries was a private line, erected in 1859, from Teheran to Sultanieh, where the Shah of Persia temporarily resided. This line, one hundred and sixty-nine miles long, after being used for one summer, was demolished. There are now about five thousand miles of telegraph in Persia alone; and the construction of the last of those lines, that from Shahrud, to Meshed, supplies an illustration of the point dealt with in this paper:

"The workmen suffered much from want of water and from heat," says the Persian Inspector-General of Telegraphs. "During the months of June and July (1876) the heat in the plains, with a cool wind blowing, rose to 140° Fahrenheit, while the heat in the shade once rose to 112° Fahrenheit. Great anxiety was felt on account of the Turcomans, who were expected to attack us every day; but not a single Turcoman was seen."

OPTICAL ILLUSIONS.



FROM an interesting series of papers in the "*Leisure Hour*," on Natural Magic, by Mr. Maskelyne, the popular conjuror, we extract the portion relating to optical illusions:—

"As a knowledge of the crewhile mysterious laws and forces of nature dawned upon mankind and let in the light of truth upon the dark doings of the heathen magicians, a new and happier era for humanity commenced; but as light itself takes time to travel, so the first glimmerings of science struggled fitfully with a painful ignorance begot of past beliefs, and long ages had to pass ere the book of nature was thrown open so that every man might read therefrom its wonders. Therefore natural magic, applied to the mystification and deception of mankind, was not confined to early ages of the world. The mediæval magicians were also adepts in the production of illusions, though their power was limited, in comparison to their earlier prototypes, in consequence of the increased knowledge of the people. Notwithstanding the severe laws enacted in the middle ages against sorcery and magic, they still flourished; and even men of honest research encouraged mystery, as when Roger Bacon said it was well to hide the discoveries of the wise from a multitude unworthy to possess them.

In mediæval times, for the awe-inspiring purposes of the magician, optical deceptions were still, as ever, well to the front. The Greek emperor Basil saw, through the agency of Theodore Santabaren, the vision of his deceased son approach full of life, and in the bright glory of his youth, and then fade before his eager and fascinated gaze. He merely viewed a clever illusion, a piece of trickery in which a picture of the

boy had been employed. This, brought nearer to a concave mirror, and so increasing in size, had appeared to advance, as if to embrace the monarch, while its sudden withdrawal made the image grow smaller, until it vanished altogether. Cornelius Agrippa's magic mirror, wherein Surrey beheld the weeping and beloved Geraldine, and the vision of the beauteous Helen of Troy, said to, have been conjured up by Faust before the eyes of the Wittenberg collegians, are both of the same order of deception.

The celebrated description by the Florentine artist, Benvenuto Cellini, of the demons evoked by the power of a Sicilian priest at Rome—whither Cellini had repaired to woo the necromantic arts when his earthly mistress had proved faithless to him—tells how, accompanied by a friend, one Vincenzo Romoli, he went to the Coliseum, where the priestly professor of the black art proceeded "to draw circles upon the ground with the most impressive ceremonies imaginable; he likewise brought hither assafetida, several precious perfumes, and fire, with some composition also which diffused noisome odours. As soon as he was in readiness he made an opening to the circle, and, having taken us by the hand, ordered the other necromancer, his partner, to throw the perfumes into the fire at the proper time; entrusting the care of the fire and perfumes to the rest; and thus he began his incantations. This ceremony lasted above an hour and a half, when there appeared several legions of devils, insonmuch that the amphitheatre was quite filled with them." However, though the priest could summon such visions, he was quite unable to present the one for which the artist panted, the bewitching face of the fair tormentor who had "jilted" him; and after two or three attempts, extending over a month (and during which time, we may be sure, the magician made efforts to

secure a portrait of Cellini's *inamorata*), the *séances* were abandoned, the defeated priest declaring that "love affairs were mere follies, from which no good could be expected." This, which gives us a fair insight into the illusions of the sixteenth century, is only a reproduction of the magic of the Egyptian wonder-workers, and accomplished by similar means, viz., the employment of mirrors and lenses, and does not require the use of a magic-lantern (invented by Kircher at a much later date), as suggested by Roscoe.

We can also trace the use of concave mirrors in Chaucer's description of the conjurors of his day, who would "bring in the similitude of a grim lion, or make flowers spring up in a meadow; sometimes they cause a vine to flourish, bearing white and red grapes; or show a castle built with stone; and when they please they cause the whole to disappear." All this leading up to Kircher's invention.

Superstition, unfortunately, is not for an age, but for all time, and though the ghost-raisers and the readers of man's horoscope are no longer rulers of their kind, but the "fools of fortune"—sunk to the level of a Vagrancy Act, and only acceptable to the illiterate and the vulgar—the glamour of the supernatural is still felt and it remains—an ever-decreasing quantity, let us hope!—to be taken into any review of the human mind. Therefore, we shall not go far wrong in following in the wake of Sir David Brewster, who, sworn foe to humbug and deceit, strove to show how many wonders there are in nature still beyond the ken of ordinary mortals, and how careful we should be before concluding that "spiritual manifestations" are due to agencies other than of this world.

For the purposes of the magician no instrument is more valuable than the concave speculum, a mirror in shape like the inside of a watch-glass.

To illustrate one of the many forms of illusion obtainable by its aid, let a partition have an aperture in it on a level with the eye of the spectator, and behind the screen

place a concave mirror reflecting the inverted skeleton, placed in a strong light. This will appear to the person in front in an upright position at the opening, and upon his advancing towards it the spectre will vanish altogether.

By a combination of plane mirrors—ordinary looking-glass, having perfectly flattened and parallel surfaces—many curious effects may be produced.

The use of concave and plane mirrors for magical purposes was superseded for a time by the more fertile field for illusion opened up by the magic-lantern, about the middle of the seventeenth century. It was introduced by Athanasius Kircher, a member of the Society of Jesus. In one of his numerous works, "*Ars Magna Lucis et Umbræ*," he described one used by him in the Jesuits' College at Rome. There is an engraving in which a room is seen divided by a partition. Upon one side of this is a lantern and the operator; on the other the spectators, and a screen to receive the images. The lantern is a large wooden box, with a door at the side and a chimney at the top; in front is a tube containing the lens and a frame for the pictures, which were painted upon glass; an oil-lamp, with a brass reflector, is inside the lamp. In the perfecting of this instrument Kircher seems to have received great assistance from a mathematician named Walgenstenius, who constructed many lanterns, and sold them to the Italian nobility, who were anxious to possess the wonderful novelty.

The phantasmagoria, an improvement upon Kircher's lantern, was introduced into Paris by one Robert, or Robertson, a conjuror, of Liege, about the year 1798; and into England by Philipstal, also a Frenchman, in 1802. This instrument differed from Kircher's in being made to run upon wheels, and was so readily brought close to, or removed from, the screen, causing the figures to grow larger or disappear altogether. The pictures on the glass, or "slider," were also opaque, excepting those parts upon which the figures were painted, so that the figures were luminous upon a

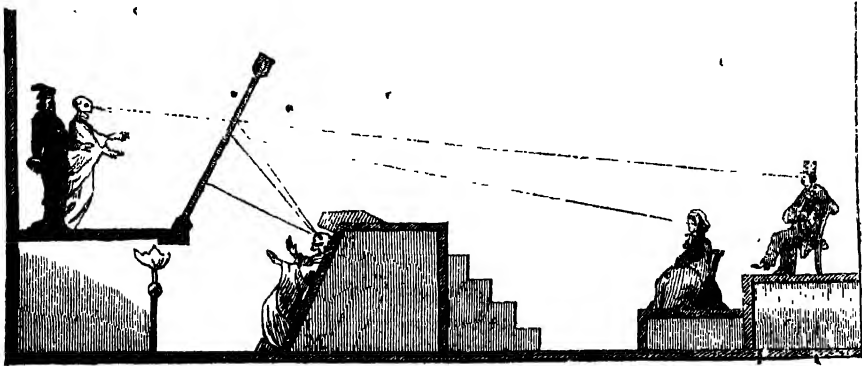
black ground, and produced a much greater effect than in the old style, where they were thrown upon the screen in a circle of light.

Another improvement in the magic-lantern was introduced in 1811, by Mr. Child, and is used for what are called dissolving views. This optical illusion when first brought into requisition for the spectral ship of Vanderdecken, in the drama of the "Flying Dutchman," at the Adelphi Theatre, caused great astonishment. In the dissolving views *two* reflectors are so placed as to throw the images of two pictures upon the same part of the screen, where they gradually melt one into the other.

That optical arrangement, the camera obscura, literally the "dark chamber," was the discovery of Baptista Porta, a Neapoli-

tan philosopher. To the great astonishment of a circle of literary and scientific friends, he brought sea and landscapes into his darkened room. This was managed by arranging panoramic effects outside the house, where many a "painted ship upon a painted ocean" lay at anchor; and boys, concealed behind fictitious trees and mountains, started real animals, or pulled "property" ones about. Possibly that zoological curiosity, the elephant of the pantomimes (with a gentlemanly "super" at one shilling per night in the fore legs, and another equally favoured being in the other two), may have first seen the light in Baptista Porta's back garden!

The well-known effects of the camera obscura may be simply obtained by closing the



shutters of a room and leaving only one small hole by which light may enter. Images of objects will then be seen in all their natural colours, but inverted, upon any white surface opposite. The addition of a convex lens will increase the brilliancy of the phenomena, and an arrangement of mirrors restore the images to the natural effect position upon the screen.

The modern illusion known as "Pepper's Ghost" has gone through several phases. Its effects are due to the optical law, that when a luminous ray falls upon a polished plane surface the reflection takes place on a plane perpendicular to the reflecting surface, and the incident and reflected rays form equal angles with it. This may be observed in the plate glass of such places

as the Burlington Arcade, the polished windows of a first-class railway carriage as it rattles through a tunnel, or the well-cleaned windows of that humbler conveyance, a metropolitan tramway-car, as it goes its night journey to the suburbs, after the closing of the shops and all is dark without.

This beautiful production of distinct visions of solid bodies upon plain unsilvered glass waited a long time before it was utilised in the illusions of M. Robin, at Paris, and the Polytechnic "ghost." In the earlier attempts in this country the person who undertook the rôle of spectre stood in a strong light at the side of the stage, the glass upon which the vision came being set in front of the audience at such an angle

as to take upon it the reflection of the figure at the "wing" which had a dark background of the same colour as that upon the stage. The difficulty was to get the phantom into a perpendicular position.

Another method, and one in very general use now, for "ghost" exhibitions, is shown in our engraving. The large glass upon the stage is so arranged as to be quite invisible to the audience, its edges being hidden by painted foliage or other contrivances. The impersonators of the spectres recline upon their backs horizontally, below the level of the stage. Here they disport themselves, every look and gesture being faithfully reproduced by the glass above, where the images appear quite erect. The left hand must always be used for the right, etc., as the image is reversed when presented to the spectators. The auditorium being dark, and the light upon the stage less vivid than that illuminating the figures below—in what is facetiously termed "the oven"—the phantoms are more distinctly visible to the audience than are the real actors, and at the same distance *behind* the glass as the originals are in front of it.

Those upon the stage cannot see the visions that "come like shadows, so depart," therefore the positions to be occupied at certain times, when they have to pass a sword or even walk through a ghost, has to be carefully arranged beforehand. Startling effects are also at the command of the exhibitor by keeping the stage dark, so that a performer, dressed exactly as the ghost below, cannot be seen. The bright light upon the figure beneath shows the vision distinctly, but this gradually subdued while, simultaneously, the lights upon the stage are raised, the ghost will appear to develop into the actor now visible behind the glass, and in the exact position occupied by the apparition.

This class of exhibition, indeed, appears marvellous to the uninitiated, and those who understand its principles cannot but admire the beautiful results. The illusions are capable of almost unlimited extension. One more may be mentioned, which pro-

duces great wonder in an audience, where a large black board is placed unmistakably in their view, and a spectre hand writes in white characters upon it. This is managed by having a duplicate board below the stage, so arranged that its shadow falls exactly over the one in view of the audience. Upon this duplicate black surface the performer writes with chalk, and, as all save his hand is covered by black cloth, and so blends with the black board above, the hand only appears to the spectators. This leaves the flesh-coloured stuffed gloves (the "materialised hands") of the spirit media far behind!

Visions of real flesh and blood may sometimes be seen floating in the air, apparently unsupported. This is also an optical deception, as the performer stands upon the edge of a thick sheet of plate glass which, its edges being carefully hidden, does not appear to the spectators.

One of the achievements of the Polytechnic was the head of Socrates, which appeared in the centre of the stage without any body attached to it, and delivered a set speech "with good accent and discretion." The sensational effect was produced by simple means, the actor's head being merely thrust through a hole in a silvered glass plate, which, by a skilful arrangement of lights and drapery, was invisible to the audience. The trick called "Palingenesia" was upon the same principle, and the limbs to be severed from the body were dummies fixed in holes in the glass, while the real limbs of the performer reposed in perfect security behind it.

The illusion of the "sweet little cherubs" who sat (or, rather, floated, sitting being an impossibility under the circumstances) "up aloft," at the Polytechnic, after the celebrated picture by Sir Joshua Reynolds, were produced by the same means; but might also have been arranged as successfully by reflections from some interesting children engaged for the occasion, whose bodies, being considered superfluous for the characters they were to represent, could be hidden behind a dark cloth, through which their heads peered. This matching in colour the

background of the stage, and skilful blending in the reflection, would assist the illusion.

Having briefly indicated the leading points in the public use of optical illusions, I may name a few for private examination, alike curious and instructive. A deformed or an amorphous drawing upon a flat surface can be so arranged that, though it have no shape or meaning to the eye, it shall yet be reflected, in perfect form and proportion, on the convex side of a cylindrical mirror placed in the proper focus, or the picture may be painted on the convex surface, and reflected on the plane. An ordinary statuette, say of a child, can be so distorted by the use of a prism with a small refracting angle, that the head may be placed upon its breast, like those

— men whose heads
Do grow beneath their shoulders ; ”

or appear severed from the body altogether.

If an intaglio (a sunken device, as an ordinary seal) be held towards a window, those parts of it farthest from the window will receive most light ; while an impression of the seal (which may be called the cameo, or raised device), if similarly placed, will receive more light upon the side *nearer* to the window. This is, of course, obvious. Now view the seal through a compound microscope, or achromatic telescope, and you invert the position of the object, and find the depressed portions have become elevated, and appear exactly as the *impression* of the seal is to the naked eye.

But the eye is literally “open” to deception without employing such instruments. Its power of retaining impressions induces it to see that which is not ; thus a lighted stick rapidly twirled round looks like a circle of fire, and bodies in swift rotation appear stationary. Natural causes produce other curious effects ; for instance, sustained vision of objects seen obliquely is impossible. This may be demonstrated by placing a pea upon a green cloth, and a narrow strip of white paper at some distance from it, but so as to be perfectly clear by indirect vision. Gazing steadily at the pea, you will notice

that shortly a part, or possibly the whole, of the white paper will vanish, the green cloth seeming to cover the spot upon which it lay. The paper may be again visible, after an interval, and once more fade away.

Atmospherical phenomena account for many ghosts, and are almost as guilty in this direction as the finger-posts at country cross-roads, that have scared so many rustic Tony Lumpkins, with their white outstretched arms, standing grimly pointing in the deserted lanes at night. The refractive power of the air produces the extraordinary illusions known as the *mirage*. These singular and magical effects have been seen in nearly all parts of the world. Humboldt, during his travels in South America, witnessed from Cumana the islands of Baracha and Licuita apparently floating in the air. Upon the coast of Africa, towards evening, the “look-out” upon a schooner observed the tall masts of another ship rise slowly from the sea. They appeared distinctly, and other parts came up above the horizon until the whole vessel was seen to first rest upon the water, and then rise above it until the hull was plainly visible. Mariners are often superstitious, and viewed such phenomena in the light of “phantom ships ;” but it was the coldness of the sea and the air above it gradually decreasing in density that caused the illusion. Among the marvels of the Paleocretic Sea are frequent magical effects, where glittering icebergs appear to float, inverted in the air, where ships are seen keel upwards and magnified in size, and ice-floes assume the appearance of fair cities, gay with “cloud-capped towers and gorgeous palaces.” This phenomenon, called “the Enchanted Coast,” was witnessed by Mr. Scoresby, on his voyage to Greenland in 1822, and he also perceived an inverted ship in the air, which was afterwards found to be the image of his father’s vessel, at that time thirty miles distant.

Sometimes spectral phenomena are produced by clouds. The good people of Florence were startled by seeing, floating above the city, a great figure of an angel,

and for some hours they were duped into a belief in a miracle, until it was found that the shadow of a gilded angel surmounting the Duomo was thrown upon the cloud by the rays of the setting sun. Hogg, the "Ettrick Shepherd," mentions the astonishment created by a similar illusion, in which the vision of a man, attended by an enormous dog, was seen in the sky. Both these effects are due to the same cause as the spectre of the Brocken (one of the loftiest of the Hartz Mountains in Hanover), where colossal figures in the air imitate the movements of the observers. These cloud phantoms are not inverted. The old adage, therefore, that "seeing is believing," must not be accepted as a truism, the eye, indeed, wonderful as are its powers of taking in form, size, position, and colour, can yet be, in its turn, "taken in" very easily, and is, as we see every day, a most innocent and

gullible organ. Our eyes are frequently made "the fools o' the other senses," conjuring up, when the mind is ill at ease, or when bodily ailments afflict us, apparitions as genuine to all appearance as the dagger of Macbeth. In our dreams there are no objects presented to the eye, though we apparently see many and in great detail; and they frequently create so great an impression upon the mind that the scenes are re-enacted in the waking moments. Spinoza avows that one morning, when starting from a dream, the vision was yet as vivid as though palpable to the touch.

It is similar illusion that "informs the eye" of the misanthrope. In his waking dreams he sees not the landscape spread before him; his eye—slave of the mind—raises phantasms unsubstantial, yet terribly real. So is it with other passions and moods of the human spirit.

BLACK VESPERS.



BLACKFRIARS was once the scene of a calamity which has come down to us under the name of the Black Vespers, or Dismal Evensong. On October 26, 1623, three hundred persons, English, Scotch, Welsh, and Irish, chiefly Catholics, with a sprinkling of Protestants, had assembled at the house of the French Ambassador, Count de Tillier, in Blackfriars, for sermon and service, not in the chapel of the Embassy, but in a chamber occupied by one Father Redyate, a room sixty feet by twenty feet, on the third floor from the ground, substantially built of brick and mortar. Father Drury, a member of a good Norfolk family, and, although a Jesuit, much respected by unprejudiced Protestants, was to be the preacher. A presentiment seems to have shadowed his mind. Al-

though of a lively disposition, he had sat sad and silent all the day before. To the last he had wished to be excused, but was persuaded by his friends to keep his appointment. When he reached the room, a gentlewoman warned him that she did not think it safe, but then it was too late to retract. Clad, according to the custom of his order, in a surplice with a linen girdle, and having on his head a red cap with a white one under it, the Father proceeded to a raised chair in the middle of the room, crossed himself, offered silent prayer, and then took his text from the Gospel for the day, Matt. xviii., emphasizing in particular the last part of the passage he had selected—"I forgave thee all that debt because thou desiredst me: shouldest not thou also have had compassion on thy fellow-servant?" Protestantism, the preacher, in some way, made out to be the wicked servant.

So he was proceeding when, in the midst of his sermon, at 4 p.m., the floor gave

way, and crashed, with the bulk of the congregation, through that of the room beneath, down to the ground. A few persons, some twenty or thirty, remained on fragments of the floor which still clung to the walls, "lifting up their hands for help, and beating their breasts for life." Eventually they cut their way through the lath and plaster partition which divided them from another room in the ambassador's house.

At the sound of the crash, a crowd suddenly assembled—as crowds do congregate, as if they had sprung up from the earth, in London—some coming simply to stare, others with spade and pickaxe to assist. For the protection of the French Embassy, the Recorder, Sergeant Finch, placed guards at the heads of all the passages. The scene within was awful. Here legs alone writhed agonizedly in the air; there a head appeared buried almost up to the lips; and yonder a half-buried body struggled to extricate itself from the heaving chaos, in which living and dead were locked together in involuntary embrace. All night, by the light of lanterns and torches, and part of

next day, the work of exhumation went on. Ninety-five corpses were dug out: amongst them those of Father Drury and his friend Father Redyate.

Having first shut up Ludgate, and doubled the guards to keep out the crowd, the Recorder and the sheriffs met at the Embassy to view the place, and a coroner's inquest was held. The verdict they brought in was "accidental death," but rabid Romanists attributed the catastrophe to Protestant conspirators, whilst rabid Protestants again cried, "God's judgment on the idolators!"

For some time afterwards the officiating priests in Roman Catholic places of worship in England used, after the benediction, to call for three Paternosters and three Ave Marias "for those who died at Blackfriars." We are told that some who had escaped with their lives when the floor fell, wished that they had perished when they heard these reiterated prayers and salutations, thinking that with such a many-lipped power of piety exerted on their behalf, their souls would have been sure of salvation.



A WONDERFUL TIMEPIECE.

AMONG the exhibits at the Paris Exhibition of 1878 was a wonderful clock, made in America, which was thus described:—"At the top is an apostolic procession, the tempting Satan, Christ, the three Marys, a figure of Justice, and a golden cock that crows after Peter has passed. Three minutes before the hour (any hour in the twenty-four), an organ inside the clock plays a hymn or an anthem. It has five tunes. Bells are then rung, and when the hour is struck the apostolic march commences. Double doors in an alcove open, and a figure of Jesus appears. Double doors to the left then open, and the apostles appear slowly

one by one in procession. As they appear and pass Jesus, they turn towards Him. Jesus bows, the apostles turn again, and proceed through the double doors in an alcove on the right. As Peter approaches, Satan looks out of a window above and tempts him. Five times the devil appears, and when Peter passes, denying Christ, the cock flaps its wings and crows. When Judas Iscariot appears, Satan comes down from his window, and follows Judas out in the procession, and then goes back and up to his place to watch, Judas appearing on both sides. After the procession has passed, Jesus and the three Marys disappear, and the door is closed. This scene can be repeated seven times in an hour if necessary, and the ordinary motion of the clock produces it four times per hour."

MONSTER GUNS.



THE development of the size and power of artillery in modern days has been wonderful. Not but what there were large guns in ancient days. At Ehrenbreitstein Castle, on the Rhine, is a prodigious cannon, $18\frac{1}{2}$ feet long, $1\frac{1}{2}$ foot in diameter on the bore, and 3 ft. 4 in. in the breech.

Its ball weighs 180 lb., and its charge of powder is 94 lb. The inscription on it shows it to have been made in 1529. On the Castle Cliff at Dover is a brass cannon, commonly called "Queen Elizabeth's Pocket Pistol," which was presented to Her Majesty by the States of Holland, for the assistance she had afforded them against Spain. It is 24 feet long, and was formerly reputed as capable of carrying a twelve-pound ball to a distance of seven miles. On its breech is a Dutch verse to this effect:—

"O'er hill and dale I throw my ball,
Breaker my name, of mound and wall."

There is a popular rhyme which runs—

"Load me well and keep me clean,
And I'll carry a ball to Calais Green,"

which is supposed to refer to this piece of ordnance; though there appears every probability that, were the experiment tried, a charge of powder would blow it to atoms. Other specimens are to be seen in various parts of the world.

The guns mentioned above, however, were mere toys, more for ornament than use. The building of the modern system of large cannon dates from 1856, when Messrs. Horsfall constructed a gun of 15 ft. 10 in. in length, and a weight of nearly 22 tons. Its cost was £3500, and, with a charge of 25 lb. of powder, it struck a target at 2000 yards. In 1859, Sir W. G. Armstrong succeeded in producing a *breech-loading* rifled wrought-iron gun of great

durability and of extreme lightness, combining a great extent of range and extraordinary accuracy. The range of a 32-pound gun on this system, charged with 5 lb. of powder, was a little more than five miles. A year afterwards, an American cannon, weighing 35 tons, stated then to be the largest in the world, was cast. For a few years there was a succession of experiments in all the countries of Europe. The various makers rivalled each other in the size of their artillery, till in 1863 a gun of Sir William Armstrong, weighing 22 tons, and of a length of 15 ft., was supposed to have reached the summit of perfection. "Big Will," however, as this gun was called, was soon superseded. Guns of 25 tons were built for the powerful ironclads under construction, then came ordnance of 35 tons; till at length the world was startled to hear of an 80-ton gun being constructed at Woolwich. The latter "Infant" did good service at Shoeburyness, and builders of iron ships began to breathe more freely in the belief that they knew now the utmost power that could be wielded against them.

They had reckoned, however, without the Italian Government. Whispers were soon abroad of an extraordinary piece of ordnance which had been constructed for the Italian Government, and which weighed 100 tons! The rumours were confirmed by experiments which made it evident that in the strife between offensive weapons and defensive armour, the former, at all events up to the present time, have had the advantage.

The weapon used in the experiments to which we refer was a 100-ton gun manufactured by the firm of Messrs. Armstrong and Co., at Newcastle-on-Tyne, to form part of the armament of one of the two Italian ironclads, the *Duilio* and the *Dandolo*, a gun which, it is worthy of remark, was ordered with extraordinary foresight and boldness by the Italian Minister of Marine,



Admiral St. Bon, when it was yet the heaviest piece of ordnance in existence weighed but 35 tons.

The length of the 100-ton gun is 32 ft. 10½ in., and its extreme diameter 6 ft. 4½ in. The bore is 17 in. In our 81-ton gun these dimensions are respectively 27 ft., 6 ft., and 16 in. The length of the bore in the 100-ton gun is 30 ft. 6 in., in the 81-ton 24 ft. Both guns are constructed on the "built up" system; but, whereas the Armstrong is composed of ten coils each of a single bar, the Woolwich gun is formed of a fewer number of coils, the coils being in this case formed of double and sometimes of triple bars. The coils in the 100-ton gun are shrunk round an inner steel tube, 6 in. thick at the powder chamber, and diminishing to 3½ in. at the muzzle. At the breech of the piece three layers of coils are placed round the tube. Ten feet from the breech, the number of layers is reduced to two, and at 15 ft. to one, the diameter at this point being but 4 ft. The gun is rifled on the polygroove system, the projectile being forced to rotate by means of a copper gas check secured to its base, and which, being "set up" by the discharge, takes the grooves. A similar copper ring placed near the head of the shot centres it during its passage along the bore. The twist given to the rifling is one turn in 45 calibres. The projectile with which the first trials were made weighed 2000 lb., or 300 lbs. more than the heaviest shot

yet fired from the Woolwich gun, and was 4 ft. long. The total cost of the gun is, in round numbers, £16,000.

One of our engravings represents the gun as it was taken from the arsenal to the firing point. It will be observed that the united power of eighteen horses and four cattle was requisite to draw it along the rather heavy road. Once arrived on the range, the gun was placed upon a specially constructed railway truck, from which it was fired.

We also give two views of one of the targets against which the 2000-lb. shots, vomited forth by this monster weapon, were directed. Four targets were built. The first was composed of very soft-hammered steel, manufactured by M. Schneider in his works at Creusot, in solid plates twenty-two inches thick. These were supported by a backing of wood twenty-nine inches in thickness, disposed in two layers—the one horizontal, the other vertical. Behind this came a double iron skin one and a half inch thick, and in rear of this again were the vertical frames of the ship, of very solid construction, supported against deck beams bent down to the ground, where they rested against massive oak timbers, driven deep into the earth and substantially strutted.

The second target was, in size and thickness of metal and backing, exactly similar to the first; but the plates, instead of being of steel, were of wrought iron, the one forming the upper part of the target being of Cammell's manufacture, the lower of Marrel's.

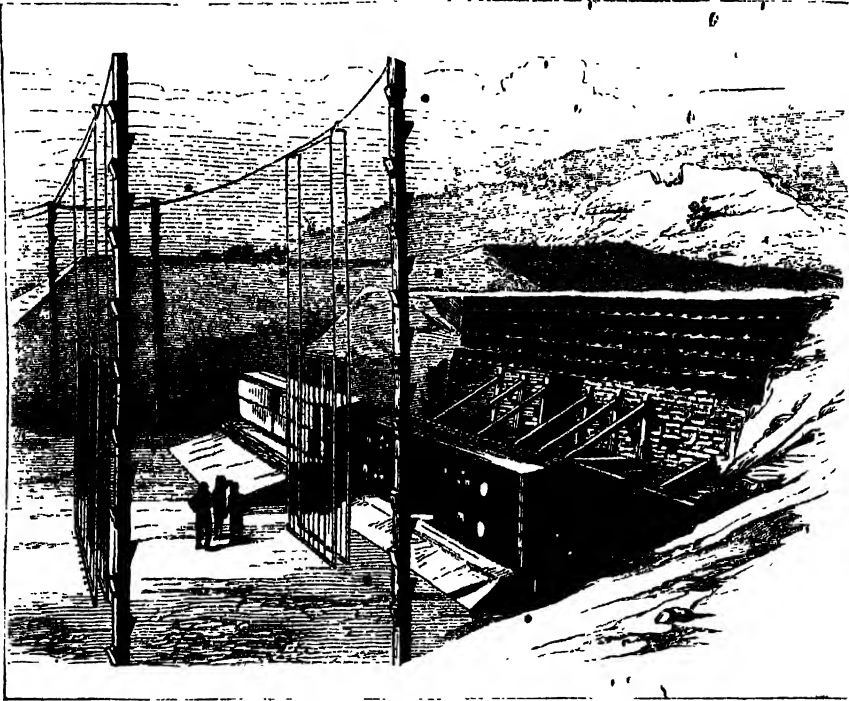
In the third target the same thickness of metal and wood was employed as in the first two; but the materials were disposed in a different manner. In the upper part of the target the vertical portion of wooden backing was interposed between two plates of Cammell's iron, the front



plate being twelve and the rear one ten inches in thickness. On the lower portion there was placed, first, an eight-inch plate of wrought iron, then a fourteen-inch plate of chilled cast iron, supported by backing arranged as in the first and second targets.

The upper portion of the fourth target was similar to the corresponding part of the third target; but Marrel's plates were employed instead of Cammell's. The plates in the lower half were the same as those in the lower portion of the third

target; but the vertical wooden backing was again interposed, in this instance between the outer wrought iron and the inner chilled cast iron plates. In the second, third, and fourth targets the plates were secured to the backing by bolts, which passed through the targets from front to rear, and were secured by nuts, screwed on inside. In the first target the bolts were driven into the target from the inside, penetrating about half way through the steel plates.



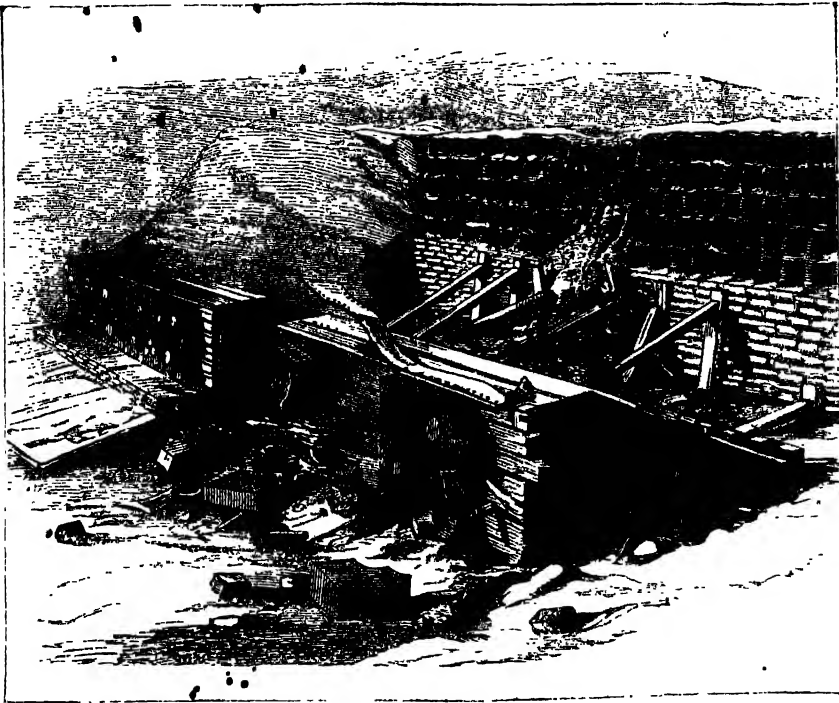
TARGET AND SCREENS BEFORE PRACTICE.

During the days preceding the decisive trials, several rounds had been fired against these targets from ten and eleven-inch guns. None of the projectiles from these comparatively light pieces of ordnance had succeeded in penetrating the forty-four inches of wood and iron opposed to them, although the plates were in many instances materially damaged, large broken pieces being driven far into the wooden backing. And it must be remarked that during these preliminary rounds, the steel plates undoubtedly suffered to a greater extent than the wrought-iron armour.

The harder metal was cracked, and starred, and fissured, by the blows inflicted upon it, whereas the more ductile material was simply driven in where struck. But when the 100-ton gun was brought to bear upon the targets, the steel plates achieved an undeniable success. Three rounds were fired against the different iron structures, and three against the steel; but as in one of the latter rounds the projectile, for some unexplained reason, broke up and failed to reach its mark, the steel plate was only struck twice. On each occasion similar

projectiles and charges were employed; 341 lb. of powder being used every round to propel a shot weighing 2000 lb. So tremendous was the force of impact, that on the first round the target, although supported in the massive manner we have described, was driven bodily back. But on neither occasion was the skin, protected by the steel plates, penetrated. It was bruised and bulged, the plate was literally smashed to pieces, what remained of it being held to the backing by a bolt here

and there, but no portion of the projectile had pierced through the ship's side. The armour had effectually performed its duty of resisting the shot, but had been broken to pieces in so doing. On the other hand, when fired against the iron targets the projectile fairly perforated the ship's side. Fired against the 22-inch thick Cammell-plate, it clave its way through the iron, through the twenty-nine inches of wooden backing, through the double skin, leaving behind it a circular aperture full four feet



AFTER PRACTICE.

in diameter. Neither did the Marrel plate or the double-plate target fare better. In both cases the result of the blow was utter ruin. The shot went through, retaining, after emerging on the other side, a velocity calculated at 650 feet per second.

Clearly, then, it is to steel and not to iron that we must look to resist the crushing blow inflicted by a projectile travelling with a velocity of nearly 1500 feet per second, and exerting the tremendous energy of more than 30,000 foot tons. No armour yet made could save a ship struck twice

in the same place in such a manner; but a sufficient thickness of steel will, at all events, prevent the first blow from being fatal, whilst iron is evidently useless for the purpose.

Briefly summarised, the result of the experiments made at Spezzia may be taken to have proved conclusively that steel plates, which were rejected by ourselves for the armour of our men-of-war, possess the power of resisting a projectile which will penetrate and utterly ruin a ship's side covered with the same thickness of wrought iron armour.

SIX MONTHS ON FLOATING ICE.

IN the month of May, 1872, the good people of St. John's, Newfoundland, were startled at hearing that a party of nineteen persons, who had spent more than half a year upon an ice-floe, during which time they had drifted a distance of about 1,500 miles, had arrived in their harbour. More surprising still, it was found that amongst the party was an infant, born only a few weeks before commencing their perilous journey, and two little children. The story is as follows:—

In the early summer of 1871, the steamship *Polaris*, under Captain Hall, left the United States, on a voyage of Arctic discovery. All went well till August, when the ship was so severely nipped by the ice that it was deemed prudent to put back into Thank God Bay. Captain Hall made an overland journey, but fatigue and exposure told upon his health, and after an absence of fourteen days he returned to the ship, and a few days later he died.

All thought of further exploration seems now to have been given up. The long dreary winter passed. Captain Tyson, the second master, describes the climate as being distinctly milder than it is several degrees farther south.

In June, the extensive plain which surrounded the harbour in which the ship was ice-bound was free from snow, and such flora as those regions boast appeared. A scant, creeping herbage covered the ground sufficient to nourish the numerous musk oxen which range these plains. Of these the expedition shot between thirty and forty. That these animals can exist here through the winter is a fact in itself indicative of a milder temperature. Besides musk oxen, rabbits and lemmings were abundant, one or two bears were seen, the

wild flowers were brilliant, and numerous birds from southern latitudes came northward in the summer. In mid-winter, notwithstanding this comparatively favourable account of the aspect and climate of the winter quarters, it was so cold that bullets of frozen quicksilver were fired through a two-inch board!

We now come to the accident which led to the wonderful voyage on an ice-floe. On October 15th, in the night-time, or, rather, in the darkness, the ship was beset by the ice that her immediate destruction appeared inevitable, her stout timbers began to crack ominously, and seemed splitting from end to end. The skylights were burst up, and a general and immediate desertion of the ship seemed the only chance. The women and children were put upon the ice first, and the men, each with his bag, containing his personal effects, ready by his side, commenced the work of discharging the provisions and most necessary articles. Suddenly, after the only two boats remaining to the ship had been placed upon the ice and a large quantity of provisions, the floe to which she was attached gave way, and the ice seemed to be breaking up under the feet of those who were upon it. The ship, which had been lying on her side, suddenly righted. Some of the party found themselves floating on a piece of ice only a few yards in diameter, and so near the ship that they called to the captain to throw them a hand-rope; he, however, told them to make for the floe, which they finally succeeded in reaching, and they saw no more of the ship that night. Next day she appeared four or five miles distant, and remained in sight all the afternoon. The party, muffled in dark clothes and ox-skins, must, they think, have been clearly seen from the ship moving about the white surface of the ice. They scaled the highest

pinnafe they could find, and fastening a waterproof blanket, bound with black, to an oar, kept it flying in the hope of attracting attention. The ship at one time seemed to be nearing, and they never for a moment doubted that she would ultimately pick them up, as no ice seemed to intercept them from her. To their dismay they watched her at last steam into a bay behind Northumberland Island, where they could distinctly see the sails furled and the steam blown off, preparatory to going into winter quarters. The party on the ice now made desperate attempts to reach the shore, but a gale was blowing and a heavy sea was running, so that they were glad to get back, after getting half-way across, with the loss of one boat, six bags of bread, and other articles of food, clothing, compass, etc. This boat got separated from them on a piece of ice, but to their intense delight they succeeded in recovering it a few days later. After repeated attempts to reach the land, they were now compelled to abandon all hope of returning to the ship, as the ice was drifting, under the influence of a strong north-east gale, rapidly to the southward.

Their provisions, after they regained the boat from which they had been separated, consisted of fourteen cans of pemmican, eleven and a half bags of bread, ten dozen one-pound and two-pound cans of meat and soup, fourteen hams, a bag of chocolate weighing twenty pounds, besides which they had some musk-ox skins, a few blankets, a tent, a number of rifles, and a large quantity of ammunition. In their various unsuccessful attempts to reach the shore both the boats had been stove in, and they now determined to sacrifice one, using the copper to repair the other, and the wood for fuel, of which, as they had not yet killed any seals, they stood much in need. The Esquimaux now set to work to build snow houses; their expertness at this description of architecture stood the party in good stead, and they were soon sheltered in three beehive-shaped huts, upon the floor of which they spread hides, while they covered themselves

at night with the same articles. The temperature inside the huts was uniformly at the freezing point of Fahrenheit.

The floe on which they found themselves was about five miles in circumference, but, owing to the incessant action of winds, waves, and frost, it was constantly altering its size and shape, sometimes splitting up and freezing together again. During the months of November, December, and January, they lived principally on their provisions, which they ate sparingly; seals were scarce, but they occasionally succeeded in killing some, the experience of the Esquimaux proving most valuable. In the latter part of February they lived principally on birds; and in March they had no lack of food or light, for they killed more seals than they could consume.

Unluckily, in this month their ice-floe showed signs of breaking up, and the waves used constantly to break over it. They, therefore, found themselves compelled to trust for safety to their solitary boat, and as she was already deeper in the water than was safe for nineteen persons, and constructed of very flimsy material, they reluctantly saw themselves obliged to abandon a great quantity of seal food. From this moment they entered upon a series of more terrible privations from cold and hunger than anything they had yet endured. Sometimes they were in the water, sometimes clinging frantically to small floes upon which they had hauled their boat, and which were being constantly swept by the icy waves, drenching the whole party, and washing away, on one occasion, their tent and their last remaining provisions.

It is astonishing that strong, healthy men could have endured such an amount of physical suffering, much less women, young children, and a new-born baby. At last they looked starvation in the face, they had eaten tanned seal-skin, and chewed everything animal they possessed. All daintiness had long since departed. Seals they had been in the habit of eating, skin and all, carefully saving the blood and every

item of the carcase except the gall. But no seal could be seen, in spite of the eager scrutiny of the Esquimaux. They were embedded in what is called "post ice," across which it is impossible to walk, and through which it is impossible to push a boat.

Death now seemed staring them in the face, and the last horrible alternative of starving men had already begun to present itself as a possibility, when one day they found themselves on a large floe, upon which the Esquimaux discovered a bear. The men were made to lie down on the ice and "play seal," thus alluring the hungry animal to what he supposed was a meal. The Esquimaux, meanwhile, secreting themselves behind a piece of ice, concentrated their energies upon a shot on which the lives of the whole party depended, and Bruin rolled over with two balls through his head. From that moment the position of the party was no longer so desperate.

They saved every inch of the bear, eating him sparingly, and soon after fell in with seal; but, what was still more to the purpose, their gaze was gladdened on the 28th of April by the sight of a steamship. They now knew they had reached the sealing ground, and might fairly hope to come across one of the numerous vessels which frequent these waters at this time of the year. On the following day, when in latitude $53^{\circ} 35'$ and only forty miles from land, they attracted the attention of the steamer *Tigress*, by firing repeated volleys from their rifles, and Captain Bartlett, who commanded her, bore down upon them and picked them up.

From having spent so long a time in the cold keen air of their icy vessel, the whole of the party experienced a dreadful feeling of suffocation on being brought into a warm ship, which did not wear off till they were safely landed at St. John's, Newfoundland.



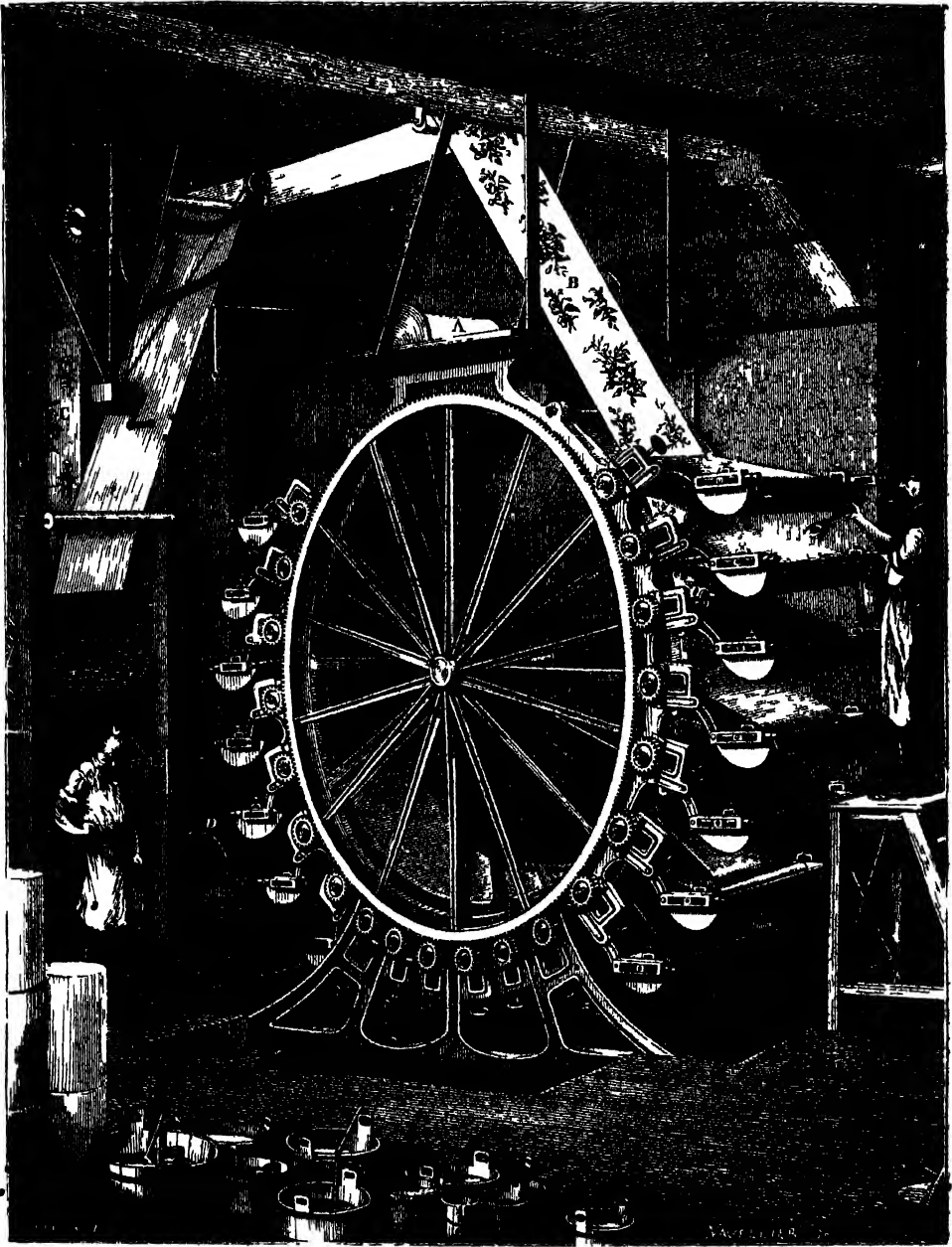
WALL-PAPER PRINTING MACHINE.

Great strides have been taken during recent years in the manufacture of paper, chiefly in the successful employment of materials previously looked upon as useless, and also by a clever adaptation of machinery, so that paper can now be made several miles in length.

Foreigners have led the way in most of these improvements. Coarse white paper was first made in this country by Speilman, a German, in 1590. For a century following our supply of white paper came from France and Holland, till the French refugees, with other useful arts, brought to England the knowledge of the process. Paper was first made by machinery by Louis Robert, a Frenchman; and another Frenchman, M. Four-

drinier, perfected the machinery in England, and obtained a patent for making it of an indefinite length in the year 1807. Stained paper hangings were made in Spain and Holland about 1555.

Our picture of the opposite page shows a machine for printing paper for decorative purposes in no less than twenty colours at one operation. This also is the invention of a Frenchman. It consists of a large and broad wheel, very strongly supported, and driven by steam, between which and the engraved rollers, the paper passes from a reel. Each roller is supplied with colour from an endless band of cloth passing through a reservoir, and pressed by small tension rollers against the engraved surface of the main roller, which again in turning impresses the pattern in colour upon the paper. In our illustration A is the reel



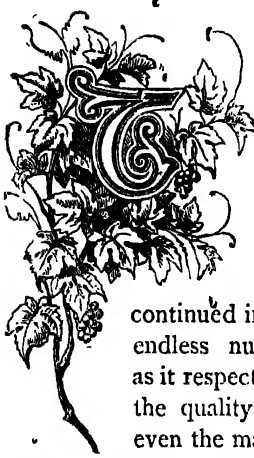
MACHINE FOR PRINTING IN TWENTY COLOURS.

of plain paper, **B** the printed paper passing to the drying box, **C** the paper printed and dried, **D** steam pipes heating the drying box.

This machine will print as many as three hundred rolls of paper per hour, although to get it into working order often takes several hours, for to obtain the "register" perfect,

namely, to make all the colours exactly coincide with the design, is difficult, and the workman has to make several experiments, sometimes very tedious ones. But once in working order the machine scarcely needs any attention except the filling of the reservoirs of colour.

THE SYRIAN GOAT.



THE domestic goat (*Capra hircus*), offers, like all thoroughly reclaimed animals over whom man has held a long continued influence, an almost endless number of varieties, as it respects size, colour, and the quality of the hair; nay, even the magnitude and number of the horns. The goats of Angora and Cappadocia have long been celebrated for their soft and silky hair, forming the staple of the cloth called camlet.

In Thibet there is a breed furnished with an undercoat of wool of exquisite fineness and delicacy; it is from this that the so much valued Cashmere shawls are fabricated. Upper Egypt has a race, on the contrary, with close smooth hair, a convex forehead, and a projecting lower jaw. The goat is abundant in Syria, where the nature of the pasturage is such as peculiarly befits it, and where it was formerly and is still kept in flocks, tended by keepers of the fold. Numerous are the allusions to it in the Holy Scriptures, from which we learn that it constituted no mean portion of the wealth of a pastoral people; its flesh was used as food, and its hair wrought into cloth. It was among the animals offered up in sacrifice under the Mosaic dispensation; and who does not recollect the scapegoat? "Then shall he *kill the goat of the sin-offering*, that is for the people, and bring his blood within the vail, and do with that blood as he did with the blood of the bullock, and sprinkle it upon the mercy seat, and before the mercy seat" (Lev. xvi. 15). "And when he hath made an end of reconciling the holy place, and the tabernacle of the congregation, and the altar, he shall bring a live goat: and Aaron shall lay both his hands upon the head of the live

goat, and confess over him all the iniquities of the children of Israel, and all their transgressions in all their sins, putting them upon the head of the goat, and shall send him away by the hand of a fit man into the wilderness: and the goat shall bear upon him all their iniquities into a land not inhabited: and he shall let go the goat in the wilderness" (Lev. xvi. 20-22).

The Mosaic dispensation was a type of that which was to come; it sets forth a sacrifice of infinite price, to be offered once and for all; one who should bear our sins to a land of oblivion, where they should be remembered no more against us. Christ is the antitype of the sacrifice and of the scapegoat; God "hath laid on Him the iniquity of us all." Let our readers turn to the ninth chapter of Paul to the Hebrews: "Christ being come an High Priest of good things to come; neither by the blood of goats and calves, but by His own blood He entered in once into the holy place, having obtained eternal redemption for us."

And again, chapter x.: "For the *law* having a shadow of good things to come, and not the very image of the things, can never with those sacrifices which they offered year by year continually make the comers thereunto, perfect." . . . "For it is not possible that the blood of bulls and of goats should take away sins."

Several travellers have noticed a breed of goats in Syria remarkable for the extent and development of the ears, which hang down so as in fact to touch the ground; and it is not a little curious to reflect upon this circumstance, trivial as it may seem in itself, inasmuch as it throws a light upon the expression of Amos: "As the shepherd taketh out of the mouth of the lion two legs, or a *piece* of an ear."* Several goats of this race have come under our own observation: their hair is long and flowing; their horns short, and curling close to the head; the ears of amazing size and thickness.



LIVINGSTONE'S LAST JOURNEYS.

DR. LIVINGSTONE had written to the effect that Lake Tanganyika poured its waters into the Albert Nyanza lake of Baker. It was felt at home that this was a matter to be cleared up, and during the opportune visit of Stanley the doctor accompanied him to ascertain the facts of the case.

The doctor then describes his intended route after Stanley left. "I propose to go from Uhyanyembe to Fipa, then round the south end of Tanganyika, Tambete or

Mbete, then across the Chambesi, and round south of Lake Bangweolo, and due west to the ancient fountains, leaving the underground excavations till after visiting Katanga. This route will serve to certify that no other sources of the Nile can come from the south without being seen by me. No one will cut me out after this exploration has been accomplished; and may the good Lord of all help me to show myself one of His stout-hearted servants, an honour to my children, and perhaps to my country and my race."

In starting again, he finds that the stores have been robbed. The losses by the Banian slaves were however made up by Mr. Stanley, who gave him twelve bales of calico, fourteen and a half bags of beads, thirty-eight coils of brass wire, a tent, boat, bath, cooking pots, twelve copper sheets and beds, trouses, jackets, and promised to send men, not slaves, from the coast. Four flannel shirts were sent by his daughter Agnes to the doctor, and Mr. Waller two pairs of fine English boots. In spite of the robbers the doctor was not badly set up after all. On the 14th of March Mr. Stanley left. To his care the doctor committed his journal, sealed with five seals.

Dr. Livingstone finally attests that, if one is but civil, he can traverse Africa unhurt from shore to shore. The simple African races would, to all appearance, be reasonably happy were it not for the unmitigated and poisonous curse of slavery, of which the following charming picture of the simplicity of African village life by Dr. Livingstone affords abundant proof: "We came to some villages among beautiful tree-covered hills, called Basilange or Mobasilange. The villages are very pretty, standing on slopes. The main street generally lies east and west, to allow the bright sun to stream his clear hot rays from one end to the other, and lick up quickly the moisture from the frequent showers which is not drained off by the slopes. A little verandah is often made in front of the door, and here at dawn the family gather round a fire, and while enjoying the heat needed in the cold that always accompanies the first darting of the light or sun's rays across the atmosphere, inhale the delicious air, and talk over their little domestic affairs. The various shaped leaves of the forest all round their village and near their nestlings are bespangled with myriads of dewdrops. The cocks crow vigorously, and strut and ogle; the kids gambol and leap on the backs of their dams quietly chewing the cud; other goats make believe fighting. Thrifty wives often bake their new clay pots in a fire, made by

lighting a heap of grass roots; the next morning they extract salt from the ashes, and so, two birds are killed with one stone. The beauty of this morning's scene of peaceful enjoyment is indescribable. Infancy gilds the fairy picture with its own lines, and it is probably never forgotten, for the young, taken up from slavers, and treated with all philanthropic missionary care and kindness, still revert to the period of infancy as the finest and fairest they have known. They would go back to freedom and enjoyment as fast as would our own sons of the soil, and be heedless to the charms of hard work and no play which we think so much better for them if not for us." How sad the contrast!

"In some cases we found all the villages deserted; the people had fled at our approach, in dread of repetitions of the outrages of Arab slavers. The doors were all shut: a bunch of the leaves of reeds or of green reeds placed across them, means 'no entrance here.' A few stray chickens wander about wailing, having hid themselves while the rest were caught and carried off into the deep forest, and the still smoking fires tell the same tale of recent flight from the slave-traders."

While Livingstone was thus marching bravely away, fresh expeditions were being prepared in England for his relief. But the health of the great explorer was completely worn out when he reached the southern extremity of Tanganyika in April, 1867, and little reliance can be placed on his observations, as he says that his head was out of order at the time. He was then suffering from a severe attack of fever, and soon afterwards he had lost all count of time. In March, 1869, he passed along the west coast of the lake, at a time when he was again suffering from illness; and during the fourteen hours of March the 7th, making the voyage against a head wind, and most of the time in darkness, he appears to have passed that part of the coast where the outlet actually is. In November, 1871, he made a voyage to the northern end of the lake, and found that

the mouth of the Ruizi is formed of three branches about twelve to fifteen yards broad, and six feet deep, with a strong current of two miles an hour. He ascertained that all the rivers found the northern end flowed into the lake, and thus confirmed Burton's original conclusions. Dr. Livingstone himself does not appear to have formed any definite opinion on the subject of Tanganyika hydrography. At Ujiji he observed that a current flowed northwards at the rate of nearly a mile an hour from February to November. Then evaporation is at its strongest, and the water begins to go gently south, until arrested by the flood from the great rains in February; so that there is a flow and reflow caused by rains and evaporation on the surface of a lake three hundred miles in length. At one time he seems to have thought there was no outlet, for he accounts for the sweetness of the water by the existence of this current flowing "through the middle of the lake lengthways." At another time he says that he has not the smallest doubt that the Tanganyika discharges somewhere, though he may not be able to find the outlet. The question was thus left in a complete state of uncertainty, and the larger portion of the lake was unsurveyed and unvisited, when Lieutenant Cameron reached its shores on the 21st February, 1874, exactly sixteen years after their discovery by Captain Burton.

We now come to the doctor's last Christmas Day. "*25th December, Christmas Day.*—I thank the good Lord for the good gift of His Son, Christ Jesus our Lord. I slaughtered an ox and gave a fundu and half to each party. This is our great day, so we rest. It is cold and wet day and night. The headman is gracious and generous, which is very pleasant compared with some, who refuse to sell, or stop to speak, or show the way."

In January we find the doctor and his men floundering on amongst the marshes. The country at this point, and to the end of his journey, was one continual morass; and he had to march through it, the rivers

only distinguishable from the surrounding waters by their deep currents, and the necessity of using canoes. In a man reduced in strength, writes Dr. Waller, and chronically affected with dysenteric symptoms, ever likely to be aggravated by exposure, the effect may be well conceived. It is possible that had Dr. Livingstone been at the head of a hundred picked Europeans, every man would have been down within the next fortnight. As it is, we cannot help thinking of his company of followers, who must have been well led, and under the most thorough control, to endure those marches at all, for nothing cowers the African so much as rain. Misled by the natives, unable to take astronomical observations on account of the rain, sodden with the wet, it was really wonderful how Dr. Livingstone held out so long. It seems that he was carried across the sponges and the rivulets on the shoulders of one or other of his men.

"*24th January.* Went on east and north-east, to avoid the deep part of a river which requires two canoes, but the man sent by the chief would certainly hide them. Went one and three-quarter hour's journey to a large stream, through drizzling rain, at least three hundred yards of deep water, amongst sedges and sponges of a hundred yards. One part was neck deep for fifty yards, and the water cold. We plunged in elephant's footprints one and half hour, then came in one hour to a small rivulet, ten feet broad, but waist deep, bridge covered and broken down. Carrying me across three of the broad deep sedgy rivers, is really a very difficult task. One we crossed was at least two thousand feet broad, or more than three hundred yards; the first part the main stream came up to Susi's mouth, and wetted my feet and legs. One held up my pistol behind; then one after another took a turn, and when he sank into a deep elephant's footprint, he required two to lift him so as to gain a footing on the level, which was ever waist deep. Others went on and bent down the grass to insure some footing on the side of

the elephant's path. Every ten, or twelve paces brought us to a clear stream, flowing fast in its channel, while over all, a strong current came bodily through all the rushes and aquatic plants. Susi had the first spell, then Fari Jala, then a tall, stout, Arab looking man, then Amoda, then Chauda, then Wade Sale; and each time I was lifted off bodily, and put on another pair of stout willing shoulders, and, fifty yards put them out of breath;—no wonder it was sore on the women folk of our party. It took us full one hour and a half for us all to cross over, and several came over twice to help me and their friends. The water was cold, and so was the wind, but no leeches plagued us. We had to hasten on the building of sheds, after crossing the second rivulet, as rain threatened us. After 4 p.m. it came on, a pouring cold rain, when we were all under cover. We are anxious about food. The lake is near, but we are not sure of provisions, as there have been changes of population. Our progress is distressingly slow. Wet, wet, wet,—sloppy weather, truly; and no observations, except that the land near the lake being level, the rivers spread out into broad friths and sponges. The streams are so numerous that there has been a scarcity of names. Here we have Loon and Luena. We had two Loons before, and another Luena." All laboured in vain; how true it is, Man proposes, but God disposes. In 1873, Dr. Livingstone is still wandering amongst these dismal swamps, deceived by the native chiefs, and often robbed by his own people. On July 14th he affectingly writes, "If the good Lord give me favour, and permits me to finish my work, I shall thank and bless Him; though it has cost me untold toil and pain and travel. 'This last trip made my hair all grey.' Nothing can add to the deeply suggestive force of those last words of the traveller, faint but pursuing. There is a good deal of his old sagacity with him to the last. "If Matipa fails us," he writes, "we must seize canoes, and go by force. The men say fear of me makes them act very cowardly. I have gone among the whole population kindly

and fairly, but I fear I must now act rigidly; for when they hear that we have submitted to injustice, they at once conclude that we are fair game for all, and they go to lengths in dealing falsely that they otherwise would never attempt. It is, I can declare, not my nature, nor has it been my practice, to go with my back up."

On Livingstone's last birthday, we have the following writing: "19th March.—Thanks to the Almighty Preserver of men for sparing me thus far in the journey of life! Can I hope for ultimate success? So many obstacles have arisen; let not Satan prevail over me, O my good Lord Jesus."

To the last Dr. Livingstone was able to seek out novelties in natural history, and to describe them. He mentions a species of fish which has the lower jaw turned down into a hook, which enables the animal to hold its mouth close to the plant as it glides up and down sucking in all the soft pulpy food; the superabundance of gelatinous nutriment makes these animals increase in bulk with extraordinary rapidity, and the food supply of the people is plenteous in consequence. But, as regards the writer, alas! that matters little. Nearer and nearer, day by day, he was coming to the end of his travels, and to his crown of glory; though not in the manner he had anticipated or proposed himself.

It is a painful effort to realize all the suffering of the great traveller in this most wearisome of marches, with health gone, strength gone, and life fast ebbing away. At length Chitambo's village was reached, and here he died. This was on April 30th, 1873. When Chitambo called, the doctor was too weak to see him, and sent word that he would see him on the morrow. Alas! that morrow he never saw. All day long his servants watched him carefully, all feeling that the end could not be far off. As the night advanced it was evident that his mind began to wander. "Is this the Luapula?" he asked. "No," was the reply; they were in Chitambo's village near the Mulilamo; and then he was silent for a while; and then, as if he could not get the

idea out of his head, he returned to it again, asking, "How many days is it to the Luapula?" "I think it is three days," was the reply of Susi. "A few seconds after," writes Mr. Waller, "as if in great pain, he half sighed, half said, 'Oh, dear, dear!' and then dosed off again. It was almost half an hour later that Susi heard Mjwara again outside the door, 'Bwana wants you, Susi.' On reaching the bed the doctor told him he wished him to boil some water; and for this purpose he went to the fire outside and soon returned with the copper kettle full. Calling him close, he asked him to bring his medicine chest and to hold the candle near him, for the man noticed he could hardly see. With great difficulty Dr. Livingstone selected the calomel, which he told him to place by his side; then directing him to pour a little water into a cup, and to put another empty one by it, he said in a low, feeble voice, 'All right; you can go out now.' These were the last words he was ever heard to speak."

At four a.m., or thereabouts, the lad Mjwara was alarmed, and cried out to Susi, "Come to Bwana; I am afraid; I don't know if he is alive," and the men went, all of them, and looked inside the hut. Passing inside, they looked towards the bed; Dr. Livingstone was not there. By the dim candle-light they found him kneeling by the bedside, his body stretched forward, his head buried in his hands upon the pillow. They watched for some sign of life, but in vain; the great traveller, the enterprising, the noble Christian, was no more.

The poor men thus bereft of their leader did all that could be expected under the circumstances. They took care of his effects, the tin boxes in which his manuscripts were preserved, his rifles, sextants, his Bible and Church Service, and the medicine chest. They elected Susi and Chumah as chiefs of the caravan, and started off for their long journey to Zanzibar, actually keeping Chitambo in ignorance of the decease of Livingstone to avoid the heavy fine which otherwise they might

have to pay. In reality the secret oozed out, and Chitambo behaved better than was expected. And at his suggestion all due honours were paid the dead; Chitambo, at the head of his people and accompanied by his wives, taking part in the proceedings. A separate hut was built for the corpse; close to this building the men constructed their huts, and then built a high stockade all round. It was hoped thus that they would be able to preserve the doctor's body with salt which they purchased and with brandy which they found in the doctor's stores. On the 3rd of May a special mourner arrived, to chant monotonously as he danced a song, the burden of which was—

"To-day the Englishman is dead
Who has different hair from ours;
Come round to see the Englishman."

The heart was placed in a tin box and buried reverently, while Jacob, one of the men, read over it the funeral service. At the end of fourteen days, the corpse, which was literally dried, was placed in calico. Next they deposited it in a case made of the bark of a myonga tree, over which a piece of sail cloth was sewn. The package afterwards was well tarred, and then lashed firmly to a pole to be carried by two men. Siecole and Wainwright then carved an inscription on a large tree of the date of Dr. Livingstone's death, and a parting request was made to Chitambo to keep the grass around clear, so as to ward off the bush fires. Two high posts, with an equally strong cross piece besides, were erected and well tarred, as a memorial of the fact that there a white man had died.

Under great discouragement and some presence of sickness the return journey was commenced. On the third day of the march quite half the men were unable to go any farther. A few days after two of the women of the party died, and they found, as, indeed, the natives told them, the district was notoriously an unhealthy one. In time they reached the broad waters of the Luapula. On the first night of encamping beyond it they lost the donkey which had

borne Livingstone so far. In the middle of the night a great disturbance, coupled with the shouting of Aurora, aroused the camp. The men rushed out, and found the stable broken down and the donkey gone. Snatching some logs, they set fire to the grass, as it was pitch dark, and by

the light saw a lion close to the body of the poor animal, which was quite dead. Those who had caught up their guns on the first alarm fired a volley, and the lion made off. It was evident that the donkey had been seized by the nose and instantly killed. At daylight the grass showed that the



LIVINGSTONE'S FOLLOWERS BRINGING HIS BODY TO THE COAST.

firing had taken effect. The lion's blood lay in a broad track, for he was apparently injured in the back, and could only drag himself along; but the footprints of a second lion were too plain to make it advisable to track him far in the thick cover he had reached, and so the search

was abandoned. The body of the donkey was left behind, but the carcase remained near the village, and it is most probable that it went to make a feast at Chisalunda's, a neighbouring headman or potentate.

On their onward way one of their number, firing wildly at a cow which had

been given them, smashed a poor fellow's thigh. The surgical operation resorted to was of the rudest character. First of all a hole was dug two feet deep and four in length, in such a manner that the patient could sit in it with his legs out before him. A large leaf was then bound round the fractured thigh, and earth thrown in, so that the patient was buried up to the chest. The next act was to cover the earth which lay over the man's legs with a thick layer of mud; then plenty of sticks and grass were collected, and a fire lit on the top, directly over the fracture. To prevent the smoke smothering the sufferer, they held a tall mat as a screen before his face, and the operation went on. After some time the heat reached the limbs underground. Bellowing with fear and covered with perspiration, the man implored them to let him out. The authorities, concluding that he had been under treatment a sufficient time, quickly unbound him and lifted him from the hole. He was now held perfectly fast, whilst two strong men stretched the wounded limb with all their might. Splints duly prepared were afterwards bound round it, and we must hope that in due time benefit accrued; but as the ball had passed through the limb, we must have our doubts on the subject. The villagers told Chumah that after the Wanyamwesi engagements they constantly treated bad gunshot wounds in this way with perfect success.

On their way many difficulties seem to have surrounded the little band. In many places they met with but a stuffy welcome. On one occasion they came into collision with the inhabitants of a town of Chawende's. Refused admission into it, one of them got through, then climbed the stockade, and opened the gate for the others. While they were looking about for huts in which to place their things, the chief's son, a drunken fellow, drew a bow and hit one of the men. This led to a general scrimmage. The men drove their assailants out of the town, who had beaten the drum and called out all the people for war. After this they made themselves safe

for the night; and as, by fortune of war, sheep, goats, fowls, and an immense quantity of food fell into their hands, they remained there a week to recruit. Once or twice they found men approaching at night to throw fire on the roofs of the huts from the outside; but with this exception they were not interfered with. On the last day but one a man approached and called to them at the top of his voice not to set fire to the chief's town, for the bad son had brought all this upon them. It was a pity such a little awkwardness should have occurred; but after all we must remember that the men did their best, they acted according to their logic, and, what is best of all, succeeded in their aim, in bringing back Livingstone's body to his native land. It is really very creditable to them that they did what they did. On a subsequent occasion some villagers tried to pick a quarrel with them for carrying flags,—as it was their invariable custom to make the drummer boy, Majuara, march at their head, whilst the union jack and the red colours of Zanzibar were carried in a foremost place in the line. Fortunately, a chief of some importance came up and stopped the discussion, or there might have been more mischief. As the men by this time knew their own strength, they were not much inclined to lower their flags.

Onward went our party of blacks, bearing their precious burden. All around them were wars and rumours of wars. Man's natural state is certainly one of war, so far as the natives of Africa are concerned. At Kunitakumla's they lost one of their Nassick boys, and waited for him in vain. Some thought he went off rather than carry a load any farther; others feared he had been killed. They searched for him five days in vain, and the poor fellow was left to his fate. In this quarter there were many slaves. On one occasion they saw five gangs bound neck to neck by chains and working in the gardens outside the houses. Coming nearer to Unyanyembe and hearing more definitely of a Livingstone Search Expedition, Jacob Wainwright, the

scribe of the party, was commissioned to write an account of the doctor's death, which he did, and sent it on by Chumah. He managed to reach the Arab settlement, and to find there Lieutenant Cameron, to whom he detailed the distressing information. After resting one day, Chumah returned to relieve his comrades according to promise, and then the weather-beaten party made their way into the Arab settlement of Kwi-hara, where they met Lieutenant Cameron and his men. They found the English officers extremely short of goods; but Lieutenant Cameron, no doubt with the object of his expedition full in view, very properly felt it to be his duty to relieve the wants of the party that had performed this herculean feat of bringing the body of the traveller he had been sent to relieve, together with every article belonging to him at the time of his death, as far as this main road to the coast.

Here in Kwi-hara the doctor had deposited four bales of cloth as a reserve stock with the Arabs, and these were immediately forthcoming for the march down; also they were provided with a companion in the person of Lieutenant Murphy. Dr. Dillon also came back with them.

At Kasehera the body of Livingstone was removed from the package of bark, which package was buried in order to make the people believe that the party were not carrying the corpse through the country, otherwise it was feared that they would have to encounter the most unrelenting hostility all along the way. Artfully Susi and Chumah re-packed up the body so as to make it appear like an ordinary travelling bale. They then made up another package, which they sent back, or rather pretended to send back, to Unyanyembe. When the men had gone back far enough, they got rid of their pretended corpse, sprang into the long grass, and found their way back to their travelling companions, who had remained waiting for them all night.

In February, 1874, the party arrived at Bagamoyo. Speedily one of Her Majesty's cruisers conveyed the acting consul, Cap-

tain Prideaux, from Zanzibar to the spot which the *cortège* had reached, and arrangements were made for transporting the remains of Dr. Livingstone to the island, some thirty miles away. Mr. Waller recalls attention to the fact that of all the train of Indian sepoys, Johanna men, Nassick boys, and Shupanga canoe-men who accompanied Dr. Livingstone when he started from Zanzibar in 1866, only five could answer to the roll-call as they handed over the dead body of their leader to his countrymen on the shore whither they had returned, and this after eight years' desperate service. We owe much to those truly noble and faithful blacks.

Of Chumah and Susi, the favourite personal attendants of the doctor, a little more may be said. It was Chumah, who when quite a child was rescued with many others by the doctor and his followers from slave drivers who were taking them down to the coast, and who, after ten years' faithful service travelling with his master through friendly and unfriendly districts and over some thousands of miles of swamp jungle and desert, came along to Unyanyembe with the news that his master had died and his fellow-servants were bearing the body thither. Susi, Dr. Livingstone's special favourite, had also been with him ten years, and tended him in his last moments. Both lads have had the advantage of regular schooling, and spoke very good English; a fact which naturally astonished Mr. Stanley when he came suddenly upon them at Ujiji, and was pointedly saluted by each in turn with "Good morning, sir."

The body of Livingstone was brought from Zanzibar to Aden in the *Calcutta*. No ceremony was observed, but the British and consular flags, as well as the flags of several vessels in the port, were lowered while the body lay in harbour.

On Saturday, April 18th, 1874, the body of the great explorer was borne, amid testimonies of profound respect from great numbers of people, to its final home in Westminster Abbey.

REMARKABLE SNOW-STORMS.



It is recorded, in the register of the parish of Wotton Gilbert, that snow began to fall on the 5th of January, 1614, and continued until the 12th of March following. It is not to be understood that the fall was uninterrupted through this interval, but that probably there was not a single day without the appearance of flakes or sleet. An immense number of human lives and of cattle was lost. This is the longest snow storm of which we have met with any notice in the public or domestic chronicles of Great Britain. What was its geographical area is unknown, but we have accounts of some very wide-spread falls.

One of the most extensive snow falls commenced May 6th, 1832, when Pachtusoff, the Russian navigator, was at Nova Zembla, and Helmersson was travelling in the Ural mountains. The descent was experienced from the former locality, through the whole range, a distance of nearly fifteen hundred miles. The great storm on the night of December 24, 1836, with which we were familiar, was also remarkable for its extent as well as for its violence, the wind blowing a hurricane. Snow covered the sixty thousand square miles of England and Wales, in many places to the depth of several feet; and all the roads of the kingdom were either obstructed or rendered quite impassable, till cuttings had been made through the drifts. At Lewes, an avalanche fell from the cliffs, destroying a number of houses and burying the inhabitants in the ruins. The storm prevailed over the north of Germany, all Holland, and the greater part of France and Spain. In the latter country, the whitened fields around Bilboa soon received a different tinge from the

blood of Espartero's soldiers, who were then prosecuting the war against the Carlists.

There is something eminently beautiful in the gentle descent of snow, as the features of the rural landscape, field, wood, homestead, and ivy tower are silently mantled with the pure and delicate material. But the scene becomes highly imposing in a mountainous country, when the gale blows tempestuously, and the flakes are driven along in clouds of irregular density, now obscuring the nearest objects, shutting out heaven and earth from sight, and then revealing for a moment, between the flying volumes, patches of sky aloft, with surrounding outlines of terrestrial nature. The storm is enjoyable by the side of the hearthstone; but it is perilous enough, and often fatal, to the lone wayfaring stranger whose track is obliterated, and to shepherds and their flocks in distant wilds. In 1719, an army of seven thousand Swedes perished in a snow-storm upon the mountains of Rudel, in their march to Drontheim.

In the remote pastoral districts of the Scottish highlands, traditionary relations of destructive snow-falls, exciting adventures, and narrow escapes, are current among the peasantry, and are often recurred to by the ingle-nook, as the wind whirls the drift around their cabins on winter nights. The "Thirteen Drifty Days" designate, in legendary lore, a specially severe interval in the year 1620, during which the snow fell on the frosted ground day and night, with little intermission. The cold was intense to a degree never before remembered; the wind was keen and biting; and through the whole period the sheep never broke their fast. About the fifth and sixth days, the younger part of the flocks began to fall into a torpid state, and soon perished. On the ninth and tenth days, the shepherds commenced forming huge semicircular walls of the dead, in order to shelter the living; but

the protection was of little avail, as want of food aided the havoc of the elements. Impelled by hunger, the sheep were seen tearing at one another's wool with their teeth. On the fourteenth day, at the close of the dismal period, many a high-lying farm had not a survivor of their once extensive flocks. Misshapen walls of dead, surrounding small prostrate groups, alone met the gaze of the owners. Out of more than twenty thousand sheep, in the extensive pastoral district of Eskdale-muir, only forty remained alive on one farm and five on another! The farm of Phants continued unstocked and untenanted for forty years after the storm; and aglen in Tweeds-muir became a common to which any one drove his flocks, and continued so upwards of a century.

A similarly bitter season, but briefer, occurred at the commencement of the year 1795. The snow fell in the night of January 24 and 25; and the storm visited with special violence the south of Scotland, from Crawford-muir to the border. Seventeen shepherds perished, and upwards of thirty were carried home insensible, but afterwards recovered; while the number of sheep that were destroyed was beyond example in the district. So completely were the flocks overwhelmed, that no one knew where they were till the thaw exposed them. Numbers were driven by the violence of the gale into the streams, where they were buried or frozen up, and finally carried out to sea by the subsequent floods. At the beds of Esk, in the Solway Firth, a place where the tide throws out and leaves whatever is borne into the estuary by the rivers, there were found the bodies of one thousand eight hundred and forty sheep, nine black cattle, three horses, two men, one woman, forty-five dogs, and a hundred and eighty hares, besides a large number of inferior animals.

There are instances of sheep surviving an entombment in the snow for a very extraordinary period. In the winter of 1800, one was buried near Kendal for thirty-three days and nights, without the possibility of moving, and yet survived; and another, in

the same winter, near Calbeck in Cumberland, endured a burial of thirty-eight days. When found, it had completely eaten the wool off both shoulders, and was reduced to a skeleton, yet it perfectly recovered. The length of time during which life may be maintained in such circumstances will of course depend upon the natural strength and endurance of the animal, the degree of cold, and the possibility of obtaining a small portion of food. It is often the case in great snow-storms, that the cold is not intense, the thermometer descending only a few degrees below the freezing point; and as snow is itself an imperfect conductor of heat, the objects which it shrouds are kept at a higher temperature than that of the exterior air, and are thus protected from its ungenial influences. Well-authenticated cases are on record of passengers being overwhelmed, and remaining alive for a considerable interval in the snow. In the year 1799, Elizabeth Woodcock, while venturing from Cambridge market to Impingham, was arrested by the drift, and buried in it for eight days and nights. While in this situation, she heard the bells of the village church ring on two successive Sundays, and was found alive; but afterwards died from injudicious though well-intended treatment.

Though with a common reputation for stupidity, the phrase of "the owrie cattle and silly sheep" is not a just description of the latter, in a state of nature, or when roused by peculiar circumstances to exercise their powers. They have generally an unerring foresight of an approaching snow-fall, or of the coming wind that will drift what is already upon the ground. Even when the weather-wise shepherd sees no prognostication of a tempest, he may behold his better-instructed flock march away to some known and approved shelter, under the guidance of this instinct. A mountaineer relates, that having left his sheep for the night, in apparently safe and comfortable quarters, he was plodding his weary way homeward, when, before distance and darkness shut them out of view, he looked back to see if they had given over work,

or had ceased to dig for food through the snow which lay upon the surface. To his surprise, they were all marching down hill towards a small plantation, to which he had been accustomed to drive them for shelter when fearing the coming of a storm. They had fallen into rows, and were pacing resolutely after each other, though there was nothing in the aspect of the sky that suggested to him the approach of foul weather.

Hogg relates a remarkable instance of the sagacity of a dog. The storm had raged during the whole night. He and his fellow-servants rose some time before day, for they had a flock of eight hundred ewes a long way distant, and they were resolved to make a bold effort to reach them. The inclosure around the house was not more than three hundred yards across, but the snow had drifted so deeply, and the wind was so violent, that it was full two hours before they cleared it. It was two hours more before they reached the sheep. Some of the ewes were found standing in a close body, but others were covered over with snow to the depth of ten feet. After extricating many, nearly three hundred and fifty

were missing when night closed. The next day the shepherds resumed the search. They passed by a deep glen full of trees; there was not the top of one of them to be seen. They came to the ground where the sheep should have been, but there was not one of them above the snow. Here and there they could perceive the heads or horns of stragglers appearing, and these were easily got out; but when they had collected these few, they could find no more. It was a kind of sloping ground, and the snow was from six to eight feet deep, and under this the sheep were lying, scattered over at least a hundred acres of heathy ground. They went about boring with their long poles, but they often did not find one sheep in a quarter of an hour. At length a white shaggy sheep-dog, named Sparkie, seemed to have comprehended their perplexity; for he began to scrape the snow, and look over his shoulder at them. On going to the spot, they found that he had marked right over a sheep. From that he flew to another, then to another, as fast as they could get them out, and ten times faster, for he had sometimes twenty or thirty holes marked beforehand.



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